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THE
NEW AND COMPLETE
AMERICAN

ENCYCLOPÆDIA:

OR,

Universal Dictionary [redacted]

OF

ARTS AND SCIENCES;

ON AN IMPROVED PLAN:
IN WHICH THE RESPECTIVE SCIENCES ARE ARRANGED INTO COMPLETE SYSTEMS,
AND THE ARTS DIGESTED INTO DISTINCT TREATISES; ALSO THE
DETACHED PARTS OF KNOWLEDGE ALPHABETICALLY
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CONTAINING A DIGEST AND DISPLAY OF THE WHOLE
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AND COMPREHENSIVE
LIBRARY OF UNIVERSAL KNOWLEDGE.

Illustrated with ONE HUNDRED AND SEVENTY COPPER PLATES, descriptive of the subjects to which they refer.

IN SEVEN VOLUMES.

VOL. I.

From the Encyclopaedia Perthensis, with Improvements.

NEW-YORK:
PRINTED AND PUBLISHED BY JOHN LOW, NO. 33 CHATHAM-STREET.
1805.

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PREFACE.

THE motive that produced the publication of this Encyclopædia originated in the general voice of a very numerous class of readers; who, although they might have been ever so anxious for the promulgation of literature, were yet induced to express their regret, that another similar work which had been published at Philadelphia, was of too voluminous and expensive a nature to answer the beneficial purposes of a general circulation.

To remedy this complaint, they chose to decide in favour of another compilation; which, whilst it should embrace all the utility without the diffuseness of the former, would nevertheless, prove equally interesting, and at the same time more conveniently portable, and might be procured at nearly one-fourth of the expense.

This opinion having been adopted as well by many gentlemen of science amongst the walks of public life, as within the range of private station and domestic duties, induced the first publisher of this work to venture on such an undertaking, in the progress of which he has been liberally supported by a very respectable subscription list, which has enabled the present publisher to prosecute the laborious task, and conduct it to its termination; although often attended with many difficulties during the most perilous seasons, when public calamity raged over the land, and pestilence might have appalled the stoutest heart.

It has however at last arrived at its *omega;* and is now offered to the public as a compilation that may answer the purpose of a well arranged library; or perhaps to some may be found even more useful, as it is so much more capable of being easily and readily consulted on most of the immense number of subjects which it comprehends. As a book of immediate reference in the various situations of life, whether literary or traditionary, it must be allowed to be the cheapest collection of human knowledge that has hitherto appeared in the United States of America; and contains upwards of one hundred and seventy Plates and Maps, accurately descriptive of the various articles to which they have reference.

But as the arts and sciences cannot be expected to comprehend all the necessary subjects of enquiry which excite the curiosity of mankind, a great proportion of the work is allotted to GEOGRAPHY, HISTORY, BIOGRAPHY, &c.; and although it may be considered as a compilation from all the best dictionaries and books of science extant, yet it may justly claim in other respects, a right to originality; as a vast mass of matter has been generously supplied by men of the first eminence in the various pursuits of literature, as well natives of America, as foreigners of distinction; who were well versed in the Mathematical, Theological, Physical, and other departments. To enumerate their names would be impracticable in the present instance, and to particularise any, might be thought invidious; they are all of them entitled to the warmest thanks of the publishers for their communications on the several topics on which they have so ably written.

The Geographical, Botanical, and Chemical parts are nearly all original; as well as those of Agriculture, Gardening, &c.

A vast number of communications have likewise been received relative to the new improvements made in the different arts and sciences; so that the whole work forms a complete succedaneum for the most voluminous treatises and dictionaries, as well as a supercedence to the vast and complicated collections of ancient and modern literature, that have so long fatigued the patience of the studious scholar, and frequently operated against that laudable pursuit of learning, which will, it is to be hoped, always continue to be cherished by every philanthropist who feels himself sincerely interested for the happiness of a well regulated society.

If, however, after all the pains and labour that has been bestowed on the work, some casual omissions might have occurred; let it be considered that in such a vast field of speculation, although every possible exertion has been made to render it perfect according to the state of each article of the arts and sciences at the time of its appearance; still the many wonderful new improvements and discoveries that are constantly taking place in the various branches of theoretical and practical knowledge, and which seem to promise so many almost everlasting additions to those great and noble subjects, prove that it would be in vain to expect perfection. All these difficulties must obviously plead as apologies for any omissions of the nature alluded to. It would therefore be unreasonable to expect more perfection in this than in any former attempt since the origin of literature. With these sentiments this Encyclopædia is now submitted to the world, having done our best to render it as perfect as possible.

THE PUBLISHER.

A NEW and COMPLETE
ENCYCLOPÆDIA:
OR, UNIVERSAL
DICTIONARY
OF
ARTS and SCIENCES.

A MAY be conſidered, I. as a *letter;* II. as a *word;* and III. as an *abbreviation.*

I. A, as a *letter*, or the mark of a vocal ſound, is the moſt ſimple, and that which the dumb are moſt eaſily taught to utter. To pronounce it clearly, we need only open the mouth wider than for any other ſound, and then emit the air from our lungs. It is the firſt letter of the alphabet in all the known languages in the world, excepting the Abyſſinian and Iriſh. In the former, according to Ludolphus, it is the thirteenth; and in the latter, it is the ſeventeenth, B being the firſt letter. We muſt ſeek the origin of this and the reſt of our letters, in the oriental languages. See ALPHABET and LETTERS. In the Engliſh language, the character A is the mark of three different ſounds, which are termed, by grammarians, the *broad* A, the *open* A, and the *slender* A. 1. The *broad* A reſembles the ſound marked by the German A, and is found in many of the monyſyllables, as *all wall, malt, salt*, &c. where it is pronounced as *au* in *cause* and *fault;* or as *aw* in *law*. It is probable that *broad* ſound was that which the Saxons expreſſed by the character A, as it is ſtill, almoſt uniformly, retained in the ruſtic pronunciation and northern dialects of England; as *taulk* for *talk maun* for *man*, *baund* for *hand*, &c. 2. The *open* A of the Engliſh is not unlike the A of the Italians, and is the ſound marked by this letter in *father*, *rather*, &c. 3. The *slender* ſound marked by the character A is peculiar to the Engliſh language, and reſembles the ſound of the French *é* maſculine, or of their dipthong *ai* in *pais;* perhaps it is a middle ſound between them, or between the *a* and *e*. Such we have in the words *place*, *face*, *waste;* and in all thoſe that terminate in *ation*, as *salvation*, *preservation*, &c.

The ſounds of which A is the character in this language, are ſometimes ſhort; as in the words *glass*, *grass*, *brass*, &c. at other times long; as in *glaze*, *graze*, &c. Their length is commonly denoted by an *i* immediately ſubjoined to the *a;* as in *plain*, *rain*, &c. or by an *e* added at the end of the word; as in *plane*, *crane*, &c. Some contend that there are 4, others that there are 5 diſtinct ſounds denoted by the character A in the Engliſh language. There are, perhaps, little variations and diſtinctions in the ſounds marked by the character A, as well as by the other vowel letters in the alphabet; but they are ſo vocal and arbitrary, or, after all, ſo nice and ſubtle, that they entirely eſcape the notice of foreigners, and are hardly diſtinguiſhd by the native Engliſh. Thoſe who deſire to enter more deeply into the firſt formation of ſounds, and to ſee the elementary principles of ſpeech treated with philoſophical accuracy, will find ſatisfaction in the ingenious treatiſes of Wallis and Holder. Mr. Sheridan's ſcheme for a ſtandard to aſcertain and fix the ſounds of letters and the pronunciation of words, is too complex for an initiatory guide to youth. To foreigners alone it may be better than an ordinary dictionary. But in point of correctneſs it is liable to ſeveral exceptions; the word *superstition*, according to Sheridan, muſt be ſounded as if the firſt ſyllables were ſpelled *shu*, which is contrary to the practice of the beſt modern ſpeakers on the Engliſh ſtage and ſenate, who uniformly give the *u* the ſame power as the peculiar *u* in French, or the *u* in *Sue*. There are words however, in which this ſyllable is ſounded like *shu*, as in *sugar;* but there is much difficulty in an attempt to fix an invariable rule; as the practice of the beſt ſpeakers will always prevail. Mr. Walker has alſo publiſhed a work on the ſame ſubject, which, though more perfect than the work of Sheridan, is not free from imperfections. As to the performances of others, they are too trivial to be critically examined. To treat minutely on the variety of ſounds in which this letter occurs, would be incompatible with our plan, as it would run into an unintereſting prolixity that could anſwer no intention whatever. In our calendar, A is the firſt of the *dominical* letters, which were introduced in imitation of the eight *nundinal* letters of the Romans, of which their A was one.

II. A as a *word*. This firſt ſimple ſound is uſed in our language to expreſs moſt of the vehement emotions of the ſoul. We naturally uſe it on all ſudden occaſions of admiration, joy, anguiſh, apprehenſion of danger, &c. and where the emotion is very great, the A is enforced by adding an aſperate to it, as *ah!* It is ſometimes a noun; for we ſay great A and little *a*; but it is moſt commonly a definite or an indefinite article. It is *definite*, and denotes the number *one*; as *a man is coming;* that is, *no more than one*. It is alſo uſed as an *indefinite* article; ſo we ſay, *a man may come this way;*

that is, *any man*. A uſed as an article, has no plural ſignification: before a word beginning with a vowel, *y* and *w* excepted, and before a ſilent *h* preceding a vowel, it is writen *an*, of which *a* is the contraction; as *an* harbor, *an* ox, *an* hour, &c. A ſeems to be a true and genuine prepoſition in the three following caſes. 1. When it is put before a particle, or participle noun, denoting ſome action not yet accompliſhed; as, I am *a* writing. 2. When it is placed before local ſirnames; as, Thomas *a* Becket. 3. When it is uſed in compoſition, e. g. *a*ſoot, *a*ſleep, &c. It is alſo ſometimes redundant, as in the words *arise*, *awake*, &c. which are not different in ſignification from *rise*, *wake*, &c. Dr. Wallis ſuppoſes it to be a contradiction of *at*; but Dr. Lowth thinks that it is the prepoſition *on*, and ſometimes *of*. *At*, he ſays, has relation chiefly to *place*; *on* a more general relation, and may be applied to *action*, and many other things as well as *place*. In ſome inſtances A has a peculiar ſignification, denoting the proportion of one thing to another; as ſuch income *a* year; ſo many hours *a* day; ſo much *a* man, &c. A, in literary compoſition, has ſometimes the power of the French *a* in theſe phraſes, *a droit*, *a guacbe*, &c. and ſometimes to be contracted from *at*, as *aside*, *aslope*, *afoot*, *asleep*, *aware*; of which the following extracts are examples:

> And now a breeze from ſhore began to blow,
> The ſailors ſhip their oars, and ceaſe to row;
> Then hoiſt their yards *atrip*, and all their ſails
> Let fall, to court the wind, and catch the gales.
>
> DRYDEN.
>
> A little houſe with trees *a*row,
> And, like its maſter, very low.
>
> POPE.

A is ſometimes added afterwards in burleſque poetry; in which caſe it only makes an additional ſyllable without any alteration of the ſenſe, as the interjection O very often does in ballads in the Engliſh language.

III. A is alſo an *abbreviation*. A put on bills of exchange, is an abbreviation for *accepted*; it is derived from the French, with whom it alſo ſtands for *accepte*. A in the antient inſcriptions of marbles, &c. occaſionally ſtands for *Augustus*, *ager*, *aiunt*, &c. When double, it denotes *Augusti*; when triple, *aurum*, *argentum*, *æs*: and ſometimes its meaning can only be known by the reſt of the inſcription. Iſidore adds, that when it occurs after the word *miles* (ſoldier) it denotes him young. On the reverſe of ancient medals, it denotes them ſtruck by the city of Argos, ſometimes by that of Athens; but on coins of modern date, it is the mark of Paris. A. M. ſtands for *Artium Magister*, Maſter of Arts; and A. B. for *Artium Baccalaureus*, Bachelor of Arts.

The Romans, in their trials, uſed their *a* to denote abſoſolution; whence Cicero calls it *litera salutaris*, or *the saving letter*. Their manner was this. Three ballots were given to each judge, marked one with an A, for *absolvo*; I abſolve; a ſecond with a C. for *condemno*; I condemn; and a third with N. L. which ſtood for *non liquet*; Is not clear. One or other of theſe each judge, according to his judgment put into an urn; and the prætor acquitted or condemned the criminal, as the one or the other of theſe letters were the moſt numerous. If the ſuffrages for acquitting and condemning were equal, the accuſed was always acquitted. The Romans alſo made uſe of the letter A in collecting their ſuffrages in caſes of legiſlation. When a new law was propoſed, or on amendment of an old one was in agitation, each voter had two ballots put into his hand; the one marked A, ſignifying *antiquo*, q. d. *antiquam volo*; I like the old way; and the other was marked U. R. for *uti rogas*; as you deſire; and his ſuffrage was given, by putting the one or the other into the urn. A. in the days of Roman barbariſm, was one of the numeral letters, & ſignified five hundred; but when written with a daſh over it, [$\bar{a}$] it denoted five thouſand.

The letter A is uſed by chronologers, &c. as an abbreviation for *anno*; ſo they put A.M. for *anno mundi*, year of the world; A. D. for *anno domini*, year of our lord, &c. The Romans dated from the building of Rome; and in their writings A. U. C. ſtands for *anno ab urbe condita*, year ſince the building of the city. The Greeks uſed A, *a*, prefixed to a word, as a private particle. With them it was alſo a numeral letter, denoting unit. A. is an abreviature uſed with different intentions: viz. in logic. A denotes an univerſal affirmative propoſition, according to the verſe—

Asserit A, *negat* E, *verum generaliter ambæ.*

A aſſerts, E denies, but the truth is generally found in both:—Thus in the firſt figure, a ſyllogiſm, conſiſting of three univerſal affirmatime propoſitions, is ſaid to be in Barba-ra; the A, thrice repeated, denoting the number of the propoſitions to be univerſal. See the Syſtem of LOGIC,

In Algebra, A, or *a*, and the firſt letters of the alphabet, repreſent *known* quantities; and the laſt letters repreſent quantities that are *unknown*. In the preſcriptions of phyſicians, A, or *a*, or *aa*. denotes equal parts of the ingredients ſpecified, and is a contraction of the prepoſition *ana*, which is uſed in the ſame ſenſe by medicinal writers in the Greek tongue. Among chymiſts, AAA, ſignifies an *amalgama*, or the operation of amalgamating.

AACH, a little town in Germany, in the circle of Suabia near the ſource of the river Aach, and almoſt equally diſtant from the Danube and the lake Conſtance. It belongs to the houſe of Auſtria, and is twelve miles north-eaſt of Schaffhauſen, and twenty-five north-weſt of Conſtance. E. long. from Philadelphia, 86, 0, Lat. 47, 55. N.

AAM, a Duch meaſure of capacity for liquids, containing about 63 pounds avoirdupois weight.

AAR, the name of two rivers, the one in Switzerland, the other in Weſtphalia. Alſo the name of a ſmall iſland in the Baltic.

AARON, high-prieſt of the Jews, and brother to Moſes, was by the father's ſide great-grandſon, and by the mother's grandſon of Levi. By God's command he met Moſes at the foot of mount Horeb, and they went together into Egypt to deliver the children of Iſrael: he had a great ſhare in all that Moſes did for their deliverance; the ſcriptures call him the prophet of Moſes, and he acted in that capacity after the Iſraelites had paſſed over the Red Sea. He aſcended mount Sinai with two of his ſons, Nadab and Abihu, and ſeventy elders of the people; but neither he nor they went higher than half way, from whence they ſaw the glory of God; only Moſes and Joſhua went to the top, where they ſtaid forty days. During their abſence, Aaron, overcome by the people's eager entreaties, ſet up the golden calf, which the Iſraelites worſhipped by his conſent. This calf has given riſe to various conjectures. Some rabbies maintain that he did not make the golden calf, but only threw the gold into the fire, to get rid of the importunities of the people ; and that certain magicians, who mingled with the Iſraelites at their departure from Egypt, caſt this gold into the figure of a calf. According to ſome authors, the fear of falling a ſacrifice to the reſentment of the people by giving a refuſal, made Aaron comply with their deſire ; and they alledge alſo, that he hoped to elude their requeſt, by demanding of the women to contribute their ear-rings, imagining they would rather chooſe to remain without a viſible deity, than be deprived of their perſonal ornaments. This affair of the golden calf happened in the third month after the Iſraelites came out of Egypt. In the firſt month of the following year, Aaron was appointed high prieſt by God, which office he executed during the time that the children of Iſrael were in the wilderneſs. He died in the fortieth year after their departure from Egypt, upon mount Hor, being then 123 years old ; A. M. 2522, of the Julian period 3262, before the Chriſtian æra 1452. With regard to the attempts of the Egyptian magicians to imitate the miracles performed by his rod, ſee ſome remarks under the article MAGIC.

AARON of Alexandria, a Chriſtian prieſt and phyſician, who flouriſhed in Egypt about the year 621. He is the moſt ancient author who has treated of the ſmall-pox.

AARON Hariſchou, a learned rabbi and caraite in the 13th century, wrote an Hebrew grammar, printed at Conſtantinople 1581 ; probably the ſame with Aaron the caraite, who wrote a commentary on the five books of Moſes, which was in MS in the late French king's library.

AARSENS (Peter) a painter, called in Italy Pietro Longo, becauſe of his ſtature, was born at Amſterdam 1519. He was eminent for all kinds of ſubjects ; but was particularly famous for altar pieces, and for repreſenting a kitchen with its furniture : he had the pain to ſee a fine altarpice of his deſtroyed by the rabble in the inſurrection of 1566, though a lady of Alcmaer offered two hundred crowns for its redemption.

AAVORA, in natural hiſtory, the fruit of a ſort of large palm tree in the Weſt Indies, and Africa. It is of the ſize of an hen's egg, and included with ſeveral more, in a large ſhell ; in the middle of the fruit there is a hard nut, about the ſize of a peach ſtone, which contains a white almond, very aſtringent, and proper to check a diarrhœa.

AB, the eleventh month of the civil year of the Hebrews, and the fifth of the eccleſiaſtical year, which begins with the month Niſan. It anſwers to the month of July ; that is, to part of our month of the ſame name, and to the beginning of Auguſt : it conſiſts of thirty days. The Jews faſt on the firſt of this month, in memory of Aaron's death ; and on the ninth, becauſe on that day, both the temple of Solomon, and that erected after the captivity, were burnt ; the former by the Chaldeans, and the latter by the Romans. The ſame day is alſo remarkable among that people for the publication of Adrian's edict, wherein they were forbid to continue in Judea, or even to look back when at a diſtance from Jeruſalem, in order to lament the deſolation of that city. The 18th of the ſame month is alſo a faſt among the Jews ; becauſe the lamp in the ſanctuary was that night extinguiſhed in the time of Ahaz. On the 24th, a feaſt in memory of the abolition of the Sadducean law, which required ſons and daughters to be equal heirs of their parents eſtate.

AB, in the Syriac calendar, is the name of the laſt ſummer month. The firſt day of this month they called *Saum Miriam*, the faſt of the virgin, becauſe the eaſtern Chriſtians faſted from that day to the fifteenth, which was therefore called *Fatbr Miriam*, the ceſſation of the faſt of the virgin.

ABA (or rather ABAU) HANIFAH, ſirnamed All-Nooman was the ſon of Thabet, and born at Coufah in the 80th year of the Hegira ; this is the moſt celebrated doctor of the orthodox Muſſulmans, and his ſect holds the principal eſteem among the four which they indifferently follow. Notwithſtanding this, he was not very well eſteemed during his life, inſomuch that khaliff Almanſor cauſed him to be impriſoned at Bagdat, for having refuſed to ſubſcribe to the opinion of abſolute predeſtination, which the Muſſulmans called Cadha. But afterwards Abou Joſeph, who was the ſovereign judge, or chancellor of the empire under the khaliff Hati, brought his doctrine into ſuch credit, that it became a prevailing opinion, That to be a good Muſſulman was to be a Haniſite. He died in the 150th year of the hegira, in the priſon of Bagdat aforeſaid. And it was not till 385 years after his death, that Melick Schah, a ſultan of the Selgiucidan race, built for him a magnificent monument in the ſame city, whereto he adjoined a college peculiarly appropriated to ſuch as made a profeſſion of this ſect. This was in the 485th year of the hegira, and Anno Chriſti 1092. The moſt eminent ſucceſſors of this doctor were Ahmed Benali, Al Giaſſes, and Al Razi who was the maſter of Naſſari : and there is a moſque particularly appropriated to them in the temple of Mecca.

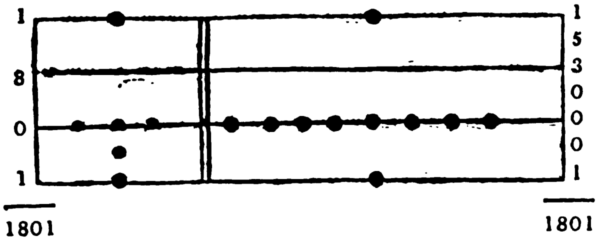
ABACA a kind of flax or hemp, gathered in ſome of the Manillas, or Phillipine iſlands. This plant is ſown every year ; being gathered, it is ſteeped in water, and beaten as hemp is. It is of two kinds, the white and the grey. The white *abaca* is uſed for making very fine linen ; but the grey is employed for nothing but cordage.

ABACH, a market town of Germany, in Lower Bavaria, ſeated on the Danube, ſix miles ſouth weſt of Rattiſbon, and twenty-nine north of Landſhut. It is remarkable for Roman antiquities, and for ſprings of mineral waters which are ſaid to be good for various diſtempers. E. Long. 86, 56. Lat. 48, 53.

ABACK (a ſea term,) the ſituation of the ſails when their ſurfaces are flatted againſt the maſts by the force of the wind. The ſails are ſaid to be *taken aback*, when they are brought into this ſituation, either by a ſudden change of the wind, or by an alteration of the ſhip's courſe. They are *laid aback*, to effect an immediate retreat, without turning to the right or left ; or, in the ſea phraſe, to give the ſhip *ſtern way*, in order to avoid ſome danger diſcovered before her in a narrow channel, or when ſhe has advanced beyond her ſtation in the line of battle, or otherwiſe. The ſails are placed in this poſition by ſlackening their lee braces, and hauling in the weather ones ; ſo that the whole effort of the wind is exerted on the fore part of their ſurface, which readily puſhes the ſhip aſtern, unleſs ſhe is reſtrained by ſome counteracting force. (See BACKING and BRACING.) It is alſo uſed to ſpread ſome ſail aback near the ſtern, as the mizen-top-ſail, when a ſhip rides with a ſingle anchor in a road, in order to prevent her from approaching it ſo as to entangle the flukes of it with her ſlackened cable, and thereby looſen it from the ground.

ABACTORS, or ABACTORES, a name given to thoſe who drive away, or rather ſteal, cattle by herds, or great numbers at once; and therefore very properly diſtinguiſhed from *ſures* or thieves.

ABACUS, an inſtrument for facilitating the operation of arithmatic. It is almoſt as ancient and extenſive as the art of arithmetic itſelf. If it be later than the methods of computing by the fingers, and by *lapilla*, or ſtones, (which obtained among the Egyptians,) it is at leaſt much prior to the uſe of numeral letters, or figures wrought with the pen. Herod. lib. 1. We find it in uſe, under ſome variations, among the Greeks, Romans, Chineſe, Germans, French, &c. It excels in point of facility and cleanlineſs of operation, as working without any ſtrokes or blots of the pen, or waſte of paper; ſome alſo give it the preference in point of expedition. The *abacus* is variouſly contrived; that chiefly uſed in European countries is made by drawing a number of parallel lines at pleaſure, at a diſtance from each other, equal to twice the diameter of a *calculus*, or counter. Here a counter, placed on the firſt or lowermoſt line, ſignifies 1; on the ſecond 10; on the third, 100; on the fourth, 1000; on the fifth, 10000; and ſo on. In the ſpaces between the lines, the ſame counters ſignify half of what they ſignify on the next upper or ſuperior line; viz. in the ſpace between the firſt and ſecond lines, 5; between the ſecond and third 50: between the third and fourth, 500; and ſo on. In the figure here ſubjoined, make the ſum of 1801, which ſum, for the better information of our readers, we have put down according to two different modes of notation.



The Grecian *abacus*, *abax*, or counting board, was an oblong frame, divided by ſeveral braſs wires, ſtretched parallel to one another, and mounted with an equal number of little ivory balls, like the beads of a necklace. By the arrangement of theſe balls, diſtinguiſhing the numbers into different claſſes, and obſerving the relations of the lower to the upper, all kinds of computations were eaſily performed.

The Roman *abacus* was much the ſame with the Grecian, except that, inſtead of ſtrings or wires, and beads, in the Romans, we find pins, and grooves for them to ſlide in. It is deſcribed by ſeveral authors; but notwithſtanding all theſe deſcriptions, we ſhould have had a very obſcure idea of the ancient manner of reckoning, had there not been figures of it found among the ancient marbles.

The Chineſe *abacus* conſiſts, like the Grecian, of ſeveral ſeries of beads, ſtrung on braſs wires, extended from the top to the bottom of the inſtrument, and divided in the middle by a croſs piece from ſide to ſide; ſo that in the upper row each ſtring has two beads, which are each reckoned for five; and in the lower row, each ſtring has five beads of different values; the firſt being reckoned as 1; the ſecond as 10; the third as 100, &c. as above. And, that inſtead of four pins, for digits or units, in the Roman *abacus*, the Chineſe have five beads. There are two different figures, and deſcriptions of the Chineſe *abacus*; one given by F. Martinius, who had lived many years in China; the other by Dr. Hook, who copied it from a Chineſe dictionary of the court-language. See SHWAN-PAN.

ABACUS, or ABACISCUS, in architecture, is the uppermoſt member of the capital of a column; ſerving as a kind of crowning both to the capital and the whole column. Many compilers of dictionaries erroneouſly make the *abacus* to be the capital itſelf. Vitruvius, and others after him, who give the hiſtory of the orders, tell us, the *abacus* was originally intended to repreſent a ſquare tile laid over an urn, or rather over a baſket. An Athenian old woman happening to place a baſket thus, covered over the root of an acanthus, that plant ſhooting up the following ſpring, encompaſſed the baſket all around, till meeting with the tile, it curled back in a kind of ſcroll. Calimachus, an ingenious ſculptor, paſſing by, took the hint, and immediately executed a capital on this plan; repreſenting the tile by the *abacus*, the curvitures of the leaves by the volutes, and the baſket by the vaſe, or body of the capital. There is ſome difference in the form of the *abacus* in different orders. In the Tuſcan, Doric, and ancient Ionic, it is a flat, ſquare member, well enough repreſenting its original tile; whence the French call it *tailloir*, or *trencher*. In the richer orders it loſes its native form; its four ſides, or faces, being arched, or cut inwards, with ſome ornament, as a roſe or other flower, or a fiſh's tail, in the middle of each arch. But ſome architects take other liberties in the *abacus*, both in reſpect of its name, place, and office. Thus, in the Tuſcan order, where it is the largeſt & moſt maſſive, as taking up one third of the height of the whole capital, it is ſometimes called the *dye of the capital.* In the Doric it is not always the uppermoſt member of the capital, a *cymatium* being frequently placed over it. In the Ionic, ſome make it a perfect ogee, and crown it with a fillet. The proportion of the *abacus*, as preſcribed by Vitruvius, is, that its diagonal (from corner to corner) be twice its height. A rule the moderns make no difficulty of diſpenſing with.

ABACUS LOGISTICUS, is a rectangled triangle, whoſe ſides forming the right angle, contain the numbers from one to ſixty, and its area, the product of each two of the oppoſite numbers. This is alſo called a *canon* of SEXAGESIMALS.

ABACUS PYTHAGORICUS, the common multiplication-table, ſo called from its being invented by Pythagoras.

ABACUS MAJOR, in metallurgic operations, the name of a trough where ore is waſhed.

ABADDON is the name which St. John in the Revelations gives to the king of the locuſts, the angel of the bottomleſs pit. The inſpired writer ſays this word in Hebrew, and in Greek, ſignifies *Appollyon*, *i. e.* a *deſtroyer*. That angel-king is thought to be Satan, or the devil: but Mr. le Clerc thinks with Dr. Hammond, that by the locuſts which came out of the abyſs, may be underſtood the zealots and robbers who miſerably afflicted the land of Judea, & laid it in a manner waſte, before Jeruſalem was taken by the Romans; and that Abaddon, the king of the locuſts, may be John of Giſchala, who having treacherouſly left that town a little before it was ſurrendered to Titus, came to Jeruſalem, where he ſoon headed part of the zealots, who acknowledged him as their king, whilſt the reſt would not ſubmit to him. This ſubdiviſion of the zealot party brought a thouſand calamities on the Jews.

ABADIR, a title which the Carthagenians gave to their gods of the firſt order. In the Roman mythology, it is the name of a ſtone which Saturn ſwallowed, by the contrivance of his wife Ops, believing it to be his new-born ſon Jupiter: hence it ridiculouſly became the object of religious worſhip.

ABÆ, or Aba, a town of Phocis in Greece, near Helicon; famous for an oracle of Apollo older than at Delphi, and for a rich temple plundered and burnt by the Perſians.

ABAFT, a ſea-term, ſignifying the hinder part of a ſhip, and all thoſe parts, both within and without, which lie towards the ſtern, and uſed in oppoſition to afore. It is alſo uſed as a prepoſition, and ſignifies *further aft, or nearer the ſtern;* as, the barracade ſtands *abaft* the main maſt, i. e. behind it, or nearer the ſtern.

ABALAK, a town in Siberia, two miles from Tobolſkoi, where there is a famous picture of the Virgin Mary, that is conſtantly viſited by a great number of pilgrims. E. Long. 139, 10. N. Lat. 57, 1.

ABALIENATION, in law, the act of transferring one man's property to another.

ABALIENATUS, among phyſicians, means corrupted. When applied to the body, it ſignifies that a part is ſo deſtroyed as to require extirpation. When applied to the ſenſes, it expreſſes their total deſtruction.

ABANA, (Bible) otherwiſe *Amana,* a river of Phœnicia, which, riſing from mount Hermon, waſhes the ſouth and weſt ſides of Damaſcus, and falls into the Phœnician ſea, to the north of Tripolis, called *Chryſorrhoas* by the Greeks.

ABANGA, the name of the fruit of the palm-tree, in the iſland of St. Thomas. The tree is the *Palma Ady.* The fruit is like a lemon externally; and the inhabitants give three or four of the kernels two or three times a-day, as a reſtorative.

ABANO, a town of the Paduano, in the Republic of Venice, famous among the ancients for its hot baths. It is five miles ſouth-weſt of Padua, and fifteen ſouth-eaſt of Nicentia. E. Long. 85, 7. N. Lat. 45, 20.

ABANTES, a people who came originally from Thrace, and ſettled in Phoceca, a country of Greece, where they built a town which they called Aba, after the name of Abas their leader; and, if we may credit ſome ancient authors, the Abantes went afterwards into the iſland of Eubœa, now called Negropont: others ſay the Abantes of Eubœa came from Athens.

ABANTIAS, or Abantis, a name of the iſland Eubœa, in the Egean ſea, extending along the coaſt of Greece from the promontory Sunium of Attica to Theſſaly; and ſeparated from Bœtia by a narrow ſtrait, called Euripus. From its length the iſland was formerly called *Macris:* afterwards *Abantias* or *Abantis,* from the Abantes, a people originally of Thrace, called by Homer *opiſthen komoontas,* from wearing their hair long behind.

ABAPTISTON, in ſurgery, the perforating part of the inſtrument called a trepan. The word is from the negative *a* and *bapto* to ſink under. This inſtrument hath had various contrivances to prevent its ſinking ſuddenly upon the membranes of the brain, when the operator is ſawing the ſkull.

ABARANER, a town of Aſia, in Grand Armenia, belonging to the Turks. It is ſeated on the river Alingena, twenty miles north of Nakſivan. E. Long. 121, 30. N. Lat. 39, 50.

ABARIM, high mountains of ſteep aſcent ſeparating the country of the Ammonites and Moabites from the land of Canaan, where Moſes died. According to Joſephus, they ſtood oppoſite to the territory of Jericho, and were the laſt ſtation but one of the Iſraelites coming from Egypt. Nebah and Piſgah were parts of theſe mountains.

ABARIS, the Hyperborean; a celebrated ſage of antiquity, whoſe hiſtory and travels have been the ſubject of much learned diſcuſſion. Such a number of fabulous ſtories were told of him, that Herodotus himſelf ſeems to ſcruple to relate them. The orator Hymerius, from the equivocal ſenſe of the word Hyperborean, ſeems to have miſtaken Abaris for a Scythian, yet deſcribes his perſon accurately, and gives him a very noble character. "They relate (ſays he) that Abaris the ſage was by nation an Hyperborean, appeared a Grecian in ſpeech, and reſembled a Scythian in his habit and appearance. He came to Athens, holding a bow in his hand, having a quiver hanging on his ſhoulders, his body wrapt up in a plad, girt about the loins with a gilded belt, and wearing trowſers reaching from his waiſt downward." By this it is evident, that he was not habited like a Scythian, who were always covered with ſkins; but appeared in the native garb of an aboriginal Scot. As to what relates to his abilities, Himerius informs us, that "he was affable and pleaſant in converſation, in diſpatching great affairs ſecret and induſtrious, quick-ſighted in preſent exigencies, in preventing future dangers circumſpect, a ſearcher after wiſdom, deſirous of friendſhip, truſting indeed little to fortune, and having every thing truſted to him for his prudence."

ABARTICULATION, in anatomy, a ſpecies of articulation admitting of a manifeſt motion; called alſo *diarthroſis,* and *dearticulatio,* to diſtinguiſh it from that ſort of articulation which admits of a very obſcure emotion, and is called *ſynarthroſis.*

ABASED, Abaise, in heraldry, is applied to the vol, or wings of eagles, &c. when the tip, or angle, points downwards towards the point of the ſhield; or when the wings are ſhut; the natural way of bearing them being ſpread, with the tip pointing to the chief, or the angles. A chevron, a pale, bend, &c. are alſo ſaid to be *abaſed,* when their points terminate in or below the centre of the ſhield. Again, an ordinary is ſaid to be *abaſed,* when below its due ſituation.

ABAS, a weight uſed in Perſia for weighing pearls. It is 1-8th leſs than the European carat.

ABASCIA, or Abcas, a country in Aſia, tributary to the Turks, ſituated on the coaſt of the Black Sea. The people are poor, thieviſh, and treacherous, inſomuch that there is no trading with them without the utmoſt caution. Their commodities are furs, buck, and tyger ſkins, linen yarn, boxwood, and bees-wax: but their greateſt traffic is in ſelling their own children, and even one another, to the

Turks; inſomuch that they live in perpetual diſtruſt. They are deſtitute of many neceſſaries of life, and have nothing among them that can be called a town; though we find Anacopia, Dandar, and Czekorni, mentioned in the maps. They have the name of Chriſtians; but have nothing left but the name, any more than the Mingrelians, their northern neighbours. The men are robuſt and active, and the women are fair and beautiful; on which account the Turks have a great value for the female ſlaves whom they purchaſe from among them. Their cuſtoms are much the ſame as thoſe of the Mingrelians. E. Long. from 114 to 116. N. Lat. from 43 to 45.

ABATE, in law, from the French, *abbatre*, ſignifies to pull down, as *to abate a nuiſance*. It is uſed by the writers of the Engliſh common law, both in an active and neutral ſenſe; as, *to abate a writ*, is, by ſome exception, to defeat or overthrow it; *a ſtranger abateth*; that is, entereth upon a houſe or land, void by the death of him that laſt poſſeſſed it, before the heir takes poſſeſſion, and ſo keepeth him out: wherefore, as he that putteth out him in poſſeſſion is ſaid to diſſeize, ſo he that ſteppeth in between the former poſſeſſor and his heir, is ſaid to abate. In the neuter ſignification thus: *the writ of the demandant ſhall abate*; that is, ſhall be diſabled, fruſtrated, or overthrown; *the appeal abateth by covin*; that is, the accuſation is defeated by deceit.

ABATEMENT, in Engliſh law, is the fruſtrating or ſetting aſide a ſuit, on account of ſome fault, either in the matter or proceeding thereof. Thus, *plea in abatement*, is ſome exception alledged either againſt the plaintiff's writ, as wanting due form, or againſt his count or declaration, as being inſufficient, or varying from the writ, ſpecialty, or record; or againſt the matter of either, as inſufficient, or being before another court; or againſt the allegations, as being uncertain, on account of ſome miſnomer, or the death of one of the parties, or the marriage of the plaintiff, being a woman; to which ſome add diſabilty. Upon any of theſe, the defendant prays, that the plaintiff's writ or plaint may *abate*, i. e. that his ſuit may ceaſe for that time. If it be granted, all writs and proceſſes muſt begin *de novo*. The death of a plaintiff did, in all caſes, *abate* the writ before judgment, until the ſtatute 8 and 9, W. III. c. 11, by which neither the death of the plaintiff or defendant ſhall *abate* it, if the action might be originally proſecuted by and againſt the executors and adminiſtrators of the parties; and if there are two or more plaintiffs or defendants, and one, or more, die, the writ or action ſhall not *abate*, if the cauſe, or action, ſurvives to the ſurviving plaintiff, againſt the ſurviving defendant, &c. It alſo denotes an irregular entry upon lands.

Abatement, in the laws of the United States. If there are two or more plaintiffs or defendants in a ſuit, and one of them dies, the writ ſhall not *abate*; but if the action ſurvives, the ſurvivor may proceed with it; and in caſe of the deceaſe of a party, the executor or adminiſtrator, in caſe the action ſurvives, may defend or proſecute. No ſummons, writ, declaration, return, proceſs, judgment, or other proceeding in civil cauſes, in any of the courts of the United States, ſhall be *abated*, arreſted, quaſhed, or reverſed. for any defect or want of form, but judgement ſhall be given without regarding ſuch imperfections, defects, or want of form, except only in caſes of demurrer, which the party demurring ſhall ſpecially ſet down and expreſs, together with his demurrer as the cauſe thereof. And the courts ſhall and may amend all and every ſuch imperfections, defects, and want of form, other than thoſe only which the party demurring ſhall expreſs, and may at any time permit either of the parties to amend any defect in the proceſs or pleadings, upon ſuch conditions as the ſaid courts reſpectively ſhall in their diſcretion, and by their rules preſcribe. Laws of U. S. c. xx, ſect. 31, 32.

Abatement, in heraldry, ſomething added to a coat of armour, to diminiſh its proper value and dignity, and note ſome diſhonourable action, or ſtain in the character of the perſon who bore it.

Abatement, in the cuſtoms, is an allowance made upon the duty of damaged goods, when the quantity is determined and aſcertained by a certificate from the proper officers. For *abatement* in commerce ſee Discount.

ABBA, in the Syriac and Chaldee languages, literally ſignifies *a father*; and figuratively, a ſuperior, reputed as a father in reſpect of age, dignity, or affection. It is more particularly uſed in the Syriac, Coptic, and Ethiopic, churches, as a title given to the biſhops. The biſhops themſelves beſtowed the title *abba* more eminently on the biſhop of Alexandria, which occaſioned the people to give him the title of *baba*, or *papa*; that is, *grandfather*; a title which he bore before the biſhop of Rome. It is a Jewiſh title of honor, given to certain rabbins, called *tanaites*; and it is alſo particularly uſed by ſome writers of the middle age, for the ſuperior of a monaſtery uſually called *abbot*. See Abbot.

ABBE, in a monaſtic ſenſe, the ſame with Abbot. Abbe, was the name of a character peculiar to France, under the monarchy. The term is not to be rendered in Engliſh, as the exiſtence of the being which it denominates is poſterior to the reformation, and no ſuch character was known among the Romaniſts till about a century and a half ago. Their privileges were many. They were admiſſible in all companies. Their dreſs was rather that of an academic, or of a profeſſed ſcholar, than that of an eccleſiaſtic; and was generally a grey, purple, or black frock. Theſe abbes were very numerous, and no leſs uſeful. They were, in colleges, and in private families, the inſtructors of youth; and many procured a decent livelihood by their literary and witty compoſitions of all kinds, from the profoundeſt philoſophy to the moſt airy romances. They were, in ſhort, a body of men poſſeſſed of a fund of univerſal talents and learning, and inceſſantly employed in the cultivation of every various branch of literature and ingenuity. No ſubject whatever eſcaped them; ſerious or gay, ſolid or ludicrous, ſacred or profane; all paid tribute to their reſearches; and as they were converſant in the loweſt as well as the higheſt topics, their fame was equally great in the learned and in the ſcribbling world. A diſtinguiſhing part of their character, too, was their devotion to the fair ſex, whoſe favorites, in return, they had the honor of being in the moſt enviable degree; the wit and ſmartneſs for which they were uſually remarkable, ſuited the French manners at that period. Theſe abbes were ſought after by moſt peeple on various accounts; as they were equally men of buſineſs and pleaſure, not leſs expert in the moſt ſerious tranſactions, than fond of enjoying their ſhare in whatever occupied the gay world. Hence they diligently frequented all public ſpectacles which were thought incomplete without them; as they compoſed the moſt intelligent part of the company, and were the moſt weighty approvers or condemners of what paſſed in almoſt all places. But in conſequence of the French revolution this claſs of characters now ceaſes to exiſt.

ABBESS, the ſuperior of an abbey or convent of nuns. The abbeſs has the ſame rights and authority over her nuns that the abbots regularly have over their monks. The ſex, indeed, does not allow her to perform the ſpiritual functions annexed to the prieſthood, wherewith the abbot is uſually inveſted; but there are inſtances of ſome abbeſſes who have a right, or rather a privilege, to commiſſion a prieſt to act for them. They have even a kind of epiſcopal juriſdiction, as well as ſome abbots who are exempted from the viſitation of their dioceſans. Martene, in his Treatiſe on the Rights of the Church, obſerves, that ſome abbeſſes have formerly confeſſed their nuns. But he adds, that their exceſſive curioſity carried them ſuch lengths, that there aroſe a neceſſity of checking it. However, St. Baſil, in his rule, allows the abbeſs to be preſent with the prieſt at the confeſſion of her nuns.

ABBEVILLE, a conſiderable city of France in Picardy, and the capital of Ponthieu; the river Somme runs through the middle of it, and divides it into two parts. It has a collegiate church and twelve pariſh-churches, the moſt conſiderable of which are St. George's and St. Giles's, beſides a great number of monaſteries and nunneries, a bailiwic, and a preſidial court. It is a fortified town; the walls are flanked with baſtions, and ſurrounded by large ditches; and it was never yet taken. The country about it is low, marſhy, and dirty. It is pretty well peopled, and is famous for its woollen manufactory. It is about fifteen miles eaſt of the Britiſh channel, and ſhips may come from thence by the river Somme to the middle of the town. It is ninety miles almoſt directly north of Paris. E. Long. 77. 6. N. Lat. 50. 7.

ABBEY, a monaſtey or religious houſe, governed by a ſuperior under the title of *abbot* or *abbeſs*.

Abbeys differ from *Priories*, in that the one are under the direction of an abbot, and the other of a prior; but abbot and prior (we mean a prior conventual) are much the ſame thing, and differ in little but the name. One third of the beſt benefices in England were anciently, by the pope's grants, appropriated to *abbeys*, and other religious houſes; which, upon their diſſolution under king Henry VIII. became lay-fees.

Monaſteries at firſt were nothing more than religious houſes, whither perſons retired from the buſtle of the world to ſpend their time in ſolitude and devotion. But they ſoon degenerated from their original inſtitution, and procured large privileges, exemptions, and riches. They prevailed greatly in Britain before the reformation, particularly in England; and as they encreaſed in riches ſo the ſtate became poor; for the land which theſe regulars poſſeſſed were *in mortua manu*, i. e. could never revert to the lords who gave them. This inconvenience gave riſe to the ſtatutes againſt gifts in *mortmaine*, which prohibited donations to theſe religious houſes; and lord Coke ſays that ſeveral lords, at their creation, had a clauſe in their grant, that the donor might give or ſell his land to whom he would, *exceptis viris religioſis & Judæis*; excepting monks and Jews.

ABBEY-BOYLE, a town of Ireland, in the county of Roſcommon and province of Connaught, twenty three miles north of Roſcommon. E. Long. 66, 28. N. Lat. 56, 54. It is remarkable for an old abbey.

ABBEY-HOLM, a town in Cumberland, ſo called from an abbey built there by David king of Scots. It ſtands on an arm of the ſea, and had a market on Saturdays; it has now a fair on October 29, for horſes and horned cattle; it is ſixteen miles ſouth-weſt of Carliſle. E. Long. 72. 22. N. Lat. 54, 45.

ABBOT, or **ABBAT**, the ſuperior of a monaſtery of monks erected into an abbey or prelacy. The name *Abbot* is originally Hebrew, where it ſignifies *father*. The Jews called *father*. in their language *Ab;* whence the Chaldeans and Syrians formed *Abba;* thence the Greeks *Abbas;* which the Latins retained, *Abbas;* and hence our *Abbot*; the French *Abbe*, &c. St. Mark and St. Paul uſe the Syriac *Abba* in their Greek, by reaſon it was then commonly known in the ſynagogues and the primitive aſſemblies of the Chriſtians; adding to it by way of interpretation, the word *father*. *Abba pater*, Abba, father; *q. d.* Abba; that is to ſay, Father. But the name Ab, or Abba, which at firſt was a term of tenderneſs and affection in the Hebrew and Chaldee, became at length a title of dignity and honor. The Jewiſh doctors affected it; and one of their moſt ancient books, containing the ſayings or apopthegms of divers of them, is entitled, Pirke *Abboth*, or Avoth; *i. e.* Chapters of the Fathers. It was in illuſion to this affection, that Jeſus Chriſt forbade his diſciples to call any man their father on earth; which word St. Jerome turns againſt the ſuperiors of the monaſteries of his time for aſſuming the title of *Abbots*, or Fathers. The name *Abbot*, then appears as old as the inſtitution of monks itſelf. The governors of the primitive monaſteries aſſumed indifferently the titles of *Abbots* and *Archimandrites*. They were diſtinguiſhed from, though frequently confounded with the clergy, becauſe a degree above laymen, and were ſubject to the biſhops and ordinary paſtors. Their monaſteries being remote from cities, built in the fartheſt ſolitudes, they had no ſhare in eccleſiaſtical affairs. They went on Sundays to the pariſh church with the reſt of the people; or, if they were too remote, a prieſt was ſent them to adminiſter the ſacraments; till at length they were allowed to have prieſts of their own body. The abbot, or archimandrite, himſelf, was uſually the prieſt; but his function extended no farther then to the ſpiritual aſſiſtance of his monaſtery; and he remained ſtill in obedience to the biſhop. There being among the abbots ſeveral perſons of learning, they made a vigorous oppoſition to the riſing hereſies of thoſe times; which firſt occaſioned the biſhops to call them out of their deſarts, and fix them about the ſuburbs of cities, and at length in the cities themſelves; from which æra their degeneracy is to be dated. The abbots, now, ſoon wore off their former plainneſs and ſimplicity, and began to be looked on as a ſort of little prelates. They aſpired at being independent of the biſhops; and became ſo inſupportable, that ſome ſevere laws were made againſt them at the Council of Chalcedon. Notwithſtanding this, in time, many of them carried the point of independency, and got the appellation of *lord*, with other badges of the epiſcopate, particularly the mitre. Hence aroſe new ſpecies of diſtinctions of *abbots;*

mitred, and not *mitred; croziered*, and not *croziered; oecumenical abbots, cardinal abbots, &c.* Thoſe were termed *mitred* abbots, who were privileged to wear the mitre, and exerciſe epiſcopal authority within their reſpective precincts, being exempted from the juriſdiction of the biſhop. The mitred abbots were lords of parliament, and called *abbots-ſovereign*, and *abbots-general*, to diſtinguiſh them from the other abbots. And as there were lords abbots, ſo there were alſo lords priors, who had exempt juriſdiction, and who were likewiſe lords of parliament, of which ſome reckon 26. Sir Edward Coke ſays, that there were 27 parliamentary abbots and two priors. Thoſe who were *not mitred* were ſubject to the *dioceſan*. Others were called *croſiered abbots*, from their bearing the croſier or paſtoral ſtaff. Others were ſtyled *oecumenical* or *univerſal abbots*, in imitation of the patriarch of Conſtantinople; while others were termed *cardinal abbots*, from their ſuperiority over all other abbots. *Abbots* were likewiſe diſtinguiſhed into *abbots elective*, and *abbots preſentative;* but latterley they have been chiefly diſtinguiſhed into *regular* and *commendatory*.

Regular ABBOTS are real monks, or religions, who have taken the vows, and wear the habit of the *order*.

ABBOTS *in commendam* are ſeculars; though they have undergone the tonſure, and are obliged, by their bulls, to take orders when they come of age. Though the term *commendam* inſinuates, that they have only the adminiſtration of their abbeys for a time, yet do they hold and reap the fruits of them forever, as well as the regular *abbots*. Their *bulls* give them a full power *tam in ſpiritualibus quam in temporalibus* (as well in ſpirituals as in temporals) and yet it is true that the commendatory *abbots* do not perform any ſpiritual offices; nor have they any ſpiritual juriſdiction over their monks. So that the phraſe *in ſpiritualibus* is rather ſomething of the Roman ſtyle than a reality.

The ceremony whereby *abbots* are created, is probably called benedictions; or ſometimes, though abuſively, conſecration. It anciently conſiſted in cloathing him with the habit called *cuculla, a cawl;* putting the paſtoral ſtaff in his hand; and the ſhoes called *pedales*, or *pedules*, on his feet. Theſe particulars we learn from the *Ordo Romanus* of Theodore, archbiſhop of Canterbury. .

Abbot is alſo a title which has been given to certain biſhops, becauſe their ſees had originally been abbeys; and they were even elected by the monks: ſuch are thoſe of Catanea, and of Montreal in Sicily.

ABBREVIATE *of Adjudications*, in Scots law, an abſtract or abridgement of a decreet of adjudication, which is recorded in a regiſter kept for that purpoſe.

ABBREVIATOR. in a general ſenſe, a perſon who abridges any large book into a narrower compaſs.

ABBREVIATORS, a college of 72 perſons in the chancery of Rome, who draw up the pope's brieves, and reduce petitions when granted by him into proper form for being converted into bulls.

ABBREVIATURE, or ABBREVIATION, properly ſignifies the ſubſtitution of a ſyllable or letter for a whole word: thus, M. ſtands for *munipulus*, a handful; and Cong. for *congius*, a gallon.

ABBREVIATURE, in a leſs proper ſenſe, is uſed for any mark or character.

ABBUTALS ſignify the buttings or boundings of land towards any point. Limits were anciently diſtinguiſhed by artificial hillocks, or ridges, which were called *botentines;* and hence *butting* or ridging. In a deſcription of the ſcite of land, the ſides on the breadth are more properly *adjacentes*, and thoſe terminating the length are *abbutantes;* which, in old ſurveys, were ſometimes expreſſed by *capitare*, to head, whence abbutals are now called *head-lands*.

ABCEDARY, or ABCEDARAIN, an epithet given to compoſitions, the parts of which are diſpoſed in the order of the letters of the alphabet: thus we ſay, Abcederain pſalms, lamentations, hymns, &c.

ABDALA, the ſon of Abdalmothleb, was the father of the prophet Mahomet.

ABDALS, in ſome eaſtern countries a kind of ſaints ſuppoſed to be inſpired to a degree of madneſs. The word comes, perhaps, from the Arabic, *Abdallah*, the ſervant of God. The Perſians call them *devanneh khodah*, ſimilar to the Latins way of ſpeaking of their prophets and ſybils, *q. d. furentes deo*, raging with the God. They are often carried by exceſs of zeal, eſpecially in ſome parts of the Indies, to run about the ſtreets, and kill all they meet of a different religion; of which travellers furniſh many inſtances. The Engliſh call this *running a muck* from the name of the inſtrument, a ſort of poniard, which they employ on thoſe deſperate occaſions. If they are killed, as it commonly happens, before they have done much miſchief, it is reckoned highly meritorious; and they are eſteemed, by the vulgar, as martyrs to their faith.

ABDERA, a maritime town of Thrace, not far from the mouth of the river Neſſus, on the eaſt ſide The foundation thereof, according to Herodotus, was attempted to be laid by Timeſius the Clazomenian; but he was forced by the Thracians to quit the deſign. The Teians undertook it, and ſucceeded; ſettling there, in order to avoid the inſults of the Perſians.—Several ſingularities are told of Abdera. The graſs of the country round it was ſo ſtrong, that ſuch horſes as eat of it ran mad. In the reign of Caſſander king of Macedon, this city was ſo peſtered with frogs and rats, that the inhabitants, were forced to quit it for a time.—The Abderites, or Abderitani, were very much derided for their want of wit and judgment: yet their city has given birth to ſeveral eminent perſons; as Protagoras, Democritus, Anaxarchus, Hecatæus the hiſtorian, Nicænetus the poet, and many others, who were mentioned among the illuſtrious men.—In the reign of Lyſimachus, Abdera was afflicted for ſome months with a moſt extraordinary diſeaſe: this was a burning fever, whoſe criſis was always on the ſeventh day, and then it left them, but it ſo diſtracted their imaginations, that they fancied themſelves players. After this, they were ever repeating verſes from ſome tragedy, and particularly out of the Andromeda of Euripides, as if they had been upon the ſtage; ſo that many of theſe pale, meager actors were pouring forth their tragic exclamations in every ſtreet. This delirium continued till the winter following; which was a very cold one, and therefore fitter to remove it. Lucian, who has deſcribed this diſeaſe, endeavours to account for it in this manner: Archelaus, an excellent player, acted the Andromeda of Euripides before the Abderites,

rites in the height of a very hot ſummer. Several had a fever at their coming out of the theatre ; and as their imaginations were full of the tragedy, the delirium which the fever raiſed repreſented perpetually Andromeda, Perſeus, Meduſa, &c. and the ſeveral dramatic incidents, and called up the ideas of thoſe objects, and the pleaſure of the repreſentation, ſo ſtrongly, that they could not forbear imitating Archelaus's action and declamation : And from theſe the fever ſpread to others by infection.

ABDEST, a Perſian word properly ſignifying the water placed in a baſon for waſhing the hands ; but is uſed to imply the legal purifications practiſed by the Mahometans before they enter on their religious ceremonies.

ABDIAS of Babylon, one of the boldeſt legend-writers, who boaſted he had ſeen our Saviour, was one of the 72 diſciples, had been eye-witneſs of the actions and prayers at the deaths of ſeveral of the apoſtles, and had followed into Perſia St. Simon and St. Jude, who, he ſaid, made him the firſt biſhop of Babylon. His book entitled *Hiſtoria certaminis apoſtolici*, was publiſhed by Wolfgang Lazius, at Bazil, 1561 ; and it has ſince borne ſeveral impreſſions in different places.

ABDICATION, the action whereby a magiſtrate, or perſon in office, renounces and gives up the ſame before the term of ſervice is expired.

This word is frequently confounded with *reſignation ;* but differs from it, in that abdication is done purely and ſimply, whereas reſignation is in favour of ſome third perſon. It is ſaid to be a renunciation, quitting, and relinquiſhing, ſo as to have nothing further to do with a thing ; or the doing of ſuch actions as are inconſiſtent with the holding of it. On king James' leaving the kingdom of England, and abdicating the government, the lords would have had the word *deſertion* made uſe of ; but the commons thought it was not comprehenſive enough, for that the king might then have liberty of returning.

ABDOMINALES, or ABDOMINAL FISHES, conſtitute the IVth Order of the *Fourth Claſs* of Animals, in the Linnæan ſyſtem. See ZOOLOGY.

ABDITÆ *Cauſæ*, are the ſecret or remote cauſes of diſtempers, which phyſicians of the dogmatic, or rational ſect, affirmed were neceſſary to be known, in order to eſtabliſh a right method of cure.

ABDOMEN, in anatomy, the belly, or lower venter ; or that part of the body comprehended between the *thorax* and the hips. Anatomiſts uſually divide the body into three regions or venters ; the *head*, the *thorax* or breaſt, and the *abdomen* which makes the loweſt part of the trunk ; being terminated by the diaphragm above, and by the *inguen* or *pubis* below. The *abdomen* is lined internally with a thin, ſoft membrane, which inveſting all the *viſcera* above-mentioned, contains and keeps them in their place ; this is called the *peritonæum ;* upon a rupture or dilatation whereof, they are apt to fall, and form thoſe tumors called *herniæ*. It is covered and defended by five pair of muſcles ; which not only defend the *viſcera*, but by their alternate relaxations and contractions in reſpiration, promote the action of digeſtion, and the extruſion of the *fæces* and urine. By their contraction, the cavity of the *abdomen* is ſtraitened, and the deſcent of the contents of the *viſcera* through the inteſtines is promoted. They are the proper antagoniſts to the ſphincters of the *anus* and bladder, and forcibly expel the excrements of thoſe parts, as alſo the *fœtus* in parturition. Theſe muſcles are the *obliquæ deſcendentes* and *aſcendentes*, the *rectus transverſalis* and *pyramidalis*.

The cavity of the abdomen, formed by the parts already mentioned (all which are covered by the ſkin and membrana adipoſa) is lined on the inſide by a particular membrane, called *peritonæum*. It is ſeparated from the cavity of the thorax by the diaphragm, and terminated below by the *muſculi lavatores ani*. This cavity contains the ſtomach and inteſtines, which are commonly divided into three ſmall parts, named duodenum, jejunum, and ilium ; and three large, called cæcum, colon, and rectum. It contains, likewiſe, the meſentery, meſocolon, omentum, liver, gall-bladder, ſpleen, pancreas, glands of the meſentery, vaſa lactea, receptaculum chyli, kidneys, renal glands, ureters, bladder, and the internal parts of generation in both ſexes. For a more copious account of the abdomen, and its ſeveral parts, ſee the Syſtem of ANATOMY.

Diſeaſes of the ABDOMEN, are inflammations, abſceſſes, *ſchirrhi*, indurations, inflatations, ſpaſms, &c. Hence the *abdomen* becomes the ſeat of divers operations ; as perforations, ſutures, ſections, &c.

Wounds of the ABDOMEN may be conſidered as of four kinds : 1. Such as affect the integuments only. 2. Such as affect the muſcles, together with the integuments, without penetrating the *peritonæum*. 3. Such as with the integuments penetrate into the cavity, without wounding any of its contents. 4. Such as penetrating into the cavity, wound ſome or other of its contents. The firſt ſort, or ſuperficial wounds of the *abdomen*, are not eſteemed dangerous, and require no treatment different from other wounds. However, Arcæus (lib. ii. cap. 4.) and Vigo (lib. iii. cap. 11.) agree in pronouncing thoſe more liable to bad accidents, which are received within two or three fingers breadth of the navel. The ſecond ſort are diſtinguiſhed from the two laſt by the probe ; for if the patient is carefully placed in the ſituation he was in when the wound was given, and the probe be introduced, it will generally paſs into the cavity of the *abdomen*, if the *peritonæum* is perforated. Another way of diſtinguiſhing theſe wounds is by injecting warm water into them ; and if it returns immediately, there is reaſon to believe the wound to be only muſcular ; but if any conſiderable quantity remain in the wound, the cavity is certainly penetrated. If the wound is large, great ſkill is required in the ſurgeon, eſpecially if it is made in a tranſverſe or oblique direction ; for in this caſe the ſuture is neceſſary to keep the gaping lips of the wound together. Having taken theſe precautions to preſerve the inteſtines and *peritonæum* in their natural ſituation, the wound is to be dreſſed with vulnerary balſams, and an adheſive plaiſter : the patient muſt alſo be enjoined abſtinence, muſt have reſt, and his bowels muſt be kept open. In wounds of the *abdomen*, that penetrate into its cavity, the ſurgeon is firſt to examine very carefully, whether any of its contents partake of the injury. It will be found that this is not the caſe, if there is no great degree of weakneſs, hæmorrhage, pain, fever, &c. if, on laying the patient on the wounded ſide, there is no diſcharge of chyle, gall, excrement, or urine ; if milk, being injected warm, returns without any alteration in its color ; if the inflicting inſtrument has not been very ſharp ;

and laſtly, if there is no vomiting or diſcharge of blood by the mouth, ſtool, or urine, nor ſwelling or hardneſs of the belly. We have ſome very valuable remarks on the hydropical tumours of the *abdomen*, in the Medical Eſſays Edinburg, Vol. 5, art. 59.

The muſcles of the belly are ſubject to inflammation, which has been miſtaken for inflammation in the liver. Hernius ſays, that theſe muſcles have a very thick membrane, which will not readily admit of the exit of pus when it is formed: he therefore adviſes to open them by inciſion, ſooner than is uſual in other inſtances of abſceſſes. The rheumatiſm ſometimes affects the muſcles of the belly, and the caſe is miſtaken for a cholic, or for an inflammation of ſome of the viſcera within: in this caſe, however, the uſual ſymptoms of inflamed viſcera are abſent, and the medicines which are uſeful in the cholic are without effect in this caſe.

There is a *ſinus* on each ſide of the *cartilago xipboides*, between the muſcles called *recti* and *tranſverſalis*, into which, on the left ſide, by violent vomiting, the ſtomach is ſometimes ruptured. This occaſions exceſſive pain, which is greater when the patient is up, and ſuſpended by his laying in an horizontal poſture: this circumſtance is the pathognomic ſign of the diſeaſe, to remove which, in caſe of its continuing obſtinate, the place muſt be laid open, and the rupture reduced in the ordinary manner.

ABDUCTION, a form of reaſoning among logicians, which conſiſts in drawing concluſions from certain and undeniable propoſitions.

Abduction, in ſurgery, a ſpecies of fracture wherein the broken parts of the bone recede from each other.

ABDUCTOR, or Abducent, in anatomy, a name given to ſeveral of the muſcles on account of their ſerving to withdraw, open, or pull back, the parts to which they are fixed.

ABEL-TREE, or Abele-tree, an obſolete name for a ſpecies of the poplar. See Populus.

Abel-beth-maacha, called alſo *Abel-maim*, a town in the tribe of Naphthali, in the north of Canaan, towards Syria where was a diſtrict called Maacha.

ABELIANS, Abeloites, or Abelonians, in church hiſtory, a ſect of heretics mentioned by St. Auſtin, which aroſe in the dioceſe of Hippo in Africa, and is ſuppoſed to have begun in the reign of Arcadius, and ended in that of Theodoſius. Indeed it was not calculated for being of any long continuance. Thoſe of this ſect regulated marriage after the example of Abel; who they pretended was married, but died without ever having known his wife. They therefore allowed each man to marry one woman, but enjoined them to live in continence; and, to keep up the ſect, when a man and woman entered into this ſociety, they adopted a boy and a girl, who were to inherit their goods, and to marry upon the ſame terms of not begetting children, but of adopting two of different ſexes.

ABELLA, anciently a town of Campania, near the river Clanus. The inhabitants were called Abellani, and ſaid to have been a colony of Chalcidians. The nux Avellana, called alſo Prænestina, or the hazel-nut, takes its name from this town, according to Macrobius. Now *Avella*.

ABELLINUM, anciently a town of the Hirpini, a people of Apulia; diſtant about a mile from the rivulet Sabbato, between Beneventum and Salernum. Pliny calls the inhabitants Abellinates, with the epithet Protopi, to diſtinguiſh them from the Abellinates Marſi. Now *Avellino*. E. Long. 90 20. N. Lat. 21.

ABELMOSCH, or Abelmusch, in botany, the trivial name of a ſpecies of the hibiſcus. See Hibiscus.

ABEL-SATTIM, or Sittim, a town in the plains of Moab, to the N. E. of the Dead Sea, not far from Jordan, where the Iſraelites committed fornication with the daughters of Moab; ſo called, probably, from the great number of ſittim trees there.

ABEN MELLER, a learned rabbin, who wrote a commentary on the Old Teſtament in Hebrew, entitled, The Perfection of Beauty. This rabbin generally follows the grammatical ſenſe and the opinions of Kimchi. The beſt edition is that of Holland.

ABENAS, a town of France in Languedoc, and in the lower Vivarais, ſeated on the river Ardeſch, at the feet of the Cevennes, 15 miles N. W. of Viviers. E. long. 79 43. N. Lat. 44 40.

ABENSPERG, a ſmall town of Germany, in the circle and Duchy of Bavaria, and in the government of Munich. It is ſeated on the river Abentz, near the Danube, 13 miles S. W. of Ratiſbon, and 20 E. of Ingolſtadt.

ABERBROTHICK, or Arbroath, one of the royal boroughs of Scotland, ſituated in the county of Angus, about forty miles N. N. E. of Edinburgh; its E. Long. being 72 31, and N. Lat. 56 36. It is ſeated on the diſcharge of the little river Brothic into the ſea, as the name imports, *Aber* in the Britiſh implying ſuch a ſituation. It is a ſmall but flouriſhing place, well built, and ſtill increaſing. The town has been in an improving ſtate for the laſt thirty years, and the number of inhabitants greatly augmented; and which is owing to the introduction of manufactures of various kinds in the brown linen and thread line. The number, at this time, is ſaid to be about three thouſand five hundred.

ABERCONWAY, or Conway, Cærnarvonſhire, N. Wales; ſo called from its ſituation at the mouth of the river Conway. It is a large well-built town, but its caſtle is now in ruins. It is governed by a mayor and two bailiffs, and has a market on Fridays. It is 229 meaſured miles from London. E. Long. 71 13, N. Lat. 53 20.

ABERDEEN, the name of two cities in Scotland, called the *Old* and *New Towns*, ſituated on the German Ocean, in E. Long. 73 20, N. Lat. 57 19.

The Old Town lies about a mile to the north of the new, at the mouth of the river Don, over which is a fine bridge, of a ſingle arch, which reſts at both ſides on two rocks. The old town was formerly the ſeat of the biſhop, and had a large cathedral commonly called *St. Macher's*. The two very antique ſpires, and one aiſle, which is uſed as a church, are now the only remains of it. *King's College*, and the Mariſhal College in the New-Town, form one univerſity. The library is large, but not remarkable for many carioſities. Hector Bœthius was the firſt principal of the college; and ſent for from Paris for that purpoſe, on an annual ſalary of forty marks Scots, at thirteen pence each. The ſquare tower on the ſide of the college was built by contributions from General Monk and the officers under him then quartered at Aberdeen, for the reception of ſtudents; of which there are about an hundred belonging to the college, who live in it.

The New-Town is the capital of the ſhire of Aberdeen. For largeneſs, trade, and beauty, it greatly exceeds any town in the north of Scotland. It is built on a hill or riſing ground, and lies on a ſmall bay formed by the Dee, deep enough for a ſhip of 200 tons. It is about two miles in circumference, and, together with the Old Town and ſuburbs, contains about 30,000 inhabitants. The buildings (which are of granite from the neighbouring quarries) are generally four ſtories high; and have for the moſt part, gardens behind them, which gives a beautiful appearance.

Aberdeen once enjoyed a good ſhare of tobacco trade, but was at length forced to reſign it to Glaſgow, which was ſo much more conveniently ſituated for it. At preſent, its imports are from the Baltic, and a few merchants trade to the Weſt Indies and North America. Its exports are ſtockings, thread, ſalmon, and oatmeal, &c. Aberdeen, with Aberbrothic, Brechin, Montroſe, and Inverbervie, returns one member to Parliament.

ABERFORD, a market town in the weſt riding of Yorkſhire, ſtands in a bottom; and is about a mile long, and indifferently well built. It is near a Roman highway, which is raiſed very high, and not far from the river Cock; between which and the town there is the foundation of an old caſtle ſtill viſible. It is 181 miles N. by W. from London. E. Long. 72 15, N. Lat. 55 52.

ABERGAVENNY, a large, populous, and flouriſhing town in Monmouthſhire, ſeated at the confluence of the rivers Uſk and Gavenny. It has a fine bridge over the Uſk conſiſting of fifteen arches; and being a great thoroughfare from the weſt part of Wales to Bath, Briſtol, Glouceſter, and other places, is well furniſhed with accommodations for travellers. It is ſurrounded with a wall, and had once a caſtle. It is 142 miles diſtant from London. E. Long. 79 15, N. Lat. 51 50.

ABERRATION, in aſtronomy, a ſmall apparent motion of the fixed ſtars diſcovered by the late Dr. Bradley. The diſcovery was made by accident in the year 1725, when Mr. Molyneux and Dr. Bradley began to obſerve the bright ſtar in the head of *Draco*, marked γ by Bayer as it paſſed near the zenith, with an inſtrument made by Mr. Graham, in order to diſcover the parallax of the earths annual orbit; and, after repeated obſervations, they found this ſtar, about the beginning of March, 1726, to be 20″ more ſoutherly than at the time of the firſt obſervation. It now indeed ſeemed to have arrived at its utmoſt limit ſouthward; becauſe, in ſeveral trials made about this time, no ſenſible difference was obſerved in its ſituation. By the middle of April, it appeared to be returning back again towards the north; and about the beginning of June, it paſſed at the ſame diſtance from the zenith as it had done in December, when it was firſt obſerved. In September following it appeared 39″ more northerly than it was in March, juſt the contrary way to what it ought to appear by the annual parallax of the ſtars. This unexpected phenomenon perplexed the obſervers very much; and Mr. Molyneux died before the true cauſe of it was diſcovered. After this, Dr. Bradley, with another inſtrument, more exact, and accurately adapted to this purpoſe, obſerved the appearances, not only in that, but many other ſtars; and by the great regularity that appeared in a ſeries of obſervations made in all parts of the year, the doctor was fully ſatisfied with regard to the general laws of the phenomena, and therefore endeavoured to find out the cauſe of them. He was already convinced that the apparent motion of the ſtars was not owing to a mutation of the earth's axis. The next thing that offered itſelf, was an alteration in the direction of the plumb-line, with which the inſtrument was conſtantly rectified; but this upon trial proved inſufficient. Then he had recourſe to what refraction might do, but here alſo nothing ſatisfactory occurred. At laſt this acute aſtronomer found, that the phenomena in queſtion proceeded from the progreſſive motion of light, and the earth's annual motion in is orbit: for he perceived, that if light was propagated in a given portion of time, the apparent place of a fixed object would not be the ſame when the eye is at reſt, as when it is moving in any other direction than that of the line paſſing through the eye and object; and, that, when the eye is moving in different directions, the apparent place of the object would be different. As we have introduced in the work a *complete Syſtem of* ASTRONOMY, it would be incompatible with our plan to enlarge further on this article of the alphabet: for a *copious* illuſtration of the ſubjects, ſee the SYSTEM.

ABERRATION, in optics, is uſed to denote that error or deviation of the rays of light, when inflected by a lens or ſpeculum, whereby they are hindered from meeting or uniting in the ſame point, called the *geometrical focus*; it is either lateral or longitudinal. The lateral *aberration* is meaſured by a perpendicular to the axis of the ſpeculum, produced by the focus, to meet the reflected or refracted ray: the longitudinal *aberration* is the diſtance of the focus from the point in which the ſame ray interſects the axis. If the focal diſtance of any lenſes be given, their apertures be ſmall, and the incident rays homogeneous and parallel, the longitudinal *aberration* will be as the ſquares, and the lateral *aberrations* as the cubes, of the linear apertures.

There are two ſpecies of *aberration*, diſtinguiſhed by their different cauſes; one ariſing from the figure of the glaſs or ſpeculum; the other from the unequal refrangibility of the rays of light. The ſecond ſpecies of *aberration* is ſometimes called the Newtonian from the name of its inventor. The former ſpecies of *aberration* is altogether inconſiderable, compared with the latter; inſomuch, that if the object-glaſs of a teleſcope be plano-convex, and the plane ſide be turned towards the object, and the diameter of the ſphere, to which the convex ſide of the glaſs is ground, be 100 feet, the ſemi diameter of the aperture be two inches, and the ratio of the ſine of incidence out of glaſs into air be to that of refraction as 20 to 31, the diameter of the circle of *aberrations* will in this caſe be only $\frac{961}{72000000}$ parts of an inch. But the diameter of the little circle through which the ſame rays are ſcattered by unequal refrangibility, will be about the 55th part of the breadth of the aperture of the object glaſs, which is here 4 inches; and therefore the error ariſing from the ſpherical figure of the glaſs is to the error ariſing from the different refrangibility of the rays as $\frac{961}{72000000}$ to $\frac{4}{55}$; that is, as 1 to 5449. See Newton's Optics, p. 83, or Smith's Optics, book ii. cap. 6. where this propoſition is demonſtrated. In conſequence of this diſcovery, and the apprehenſions that equal refractions muſt produce equal divergencies in every ſort of medium, it was imagined that all ſpherical object-glaſſes of teleſcopes would be equally affected by the different refrangibility of light, in proportion to their aperture, of whatever materials they were conſtructed; and therefore, that the only improvement of which refracting teleſcopes were capable, was that of increaſing their length. On this account ſir Iſaac Newton, and others after him, deſpairing of ſucceſs in the manufacture and uſe of refracting lenſes, directed their chief attention to the conſtruction of reflecting teleſcopes. However, in 1747, Mr. Euler applied himſelf to the ſubject of refraction, and purſuing a hint ſeggeſted by ſir Iſaac Newton, formed a ſcheme of making object-glaſſes with two lenſes of glaſs, incloſing water between them; hoping that, by conſtructing them of different materials, the refractions would balance one another, and prevent the uſual *aberrations*. Mr. Dollond examined this ſcheme, and found that Mr. Euler's principles were unſatisfactory. Mr. Clairaut likewiſe concurred in opinion, that his ſpeculations were more ingenious than uſeful.

This controverſy, which promiſed to be of great importance in the ſcience of optics, engaged the attention of M. Klingerſtierna of Sweden, and induced him carefully to examine the eighth experiment in the ſocond part of Newton's Optics, with the concluſions which he draws from it. He found that the rays of light, in the circumſtances there ſuppoſed, did not loſe their colour as ſir Iſaac Newton imagined. This hint of the Swediſh philoſopher led Mr. Dollond to re-examine the ſame experiment; and it appeared, after accurate trials, that different ſubſtances made the light to diverge very differently, in proportion to their general refractive power; therefore in the year 1757, he procured wedges of different kinds of glaſs, and applied them together, ſo that the refractions might be made in contrary directions, in order to diſcover whether the refraction and divergency of colour would vaniſh together. The reſult of his firſt trials encouraged him to perſevere; for he diſcovered a difference far beyond his hopes in the refractive qualities of different kinds of glaſs, with reſpect to their divergency of colours. The Venice glaſs, and the Engliſh crown glaſs, were found to be nearly allied in this reſpect; the common Engliſh plate glaſs made the light diverge more, and the Engliſh flint glaſs moſt of all. Without enquiring into the cauſe of this difference, he proceeded to adapt wedges of crown glaſs, and of white flint glaſs; ground to different angles, to each other, ſo as to refract in different directions; and the refracted light was entirely free from colors. Having meaſured the refractions of each wedge, he found that of the white glaſs to be to that of the crown glaſs nearly as *two* to *three*; and he deduced this general concluſion, that any two wedges, made in this proportion, and applied together ſo as to refract in contrary directions, would refract the light without any *aberration* of the rays.

Mr. Dollond's next object was to make ſimilar trials with ſpherical glaſſes, of different materials; and in order to obtain a refraction of light in contrary directions, one muſt be concave, and the other convex. The latter, which was to refract the moſt, that the rays might converge to a real focus, was made of crown glaſs, the former of white flint glaſs; and the refractions of ſpherical glaſſes being an inverſe ratio of their focal diſtances, it was neceſſary that the focal diſtances of the two glaſſes ſhould be inverſely as the ratios of the refractions of the wedges; for, being thus proportioned, every ray of light that paſſes through this combined glaſs, at any diſtance from its axis, will conſtantly be refracted, by the difference between two contrary refractions, in the proportion required; and therefore the different refrangibility of the light will be entirely removed. But in the applications of this admirable diſcovery to practice many difficulties occurred. At length, however, by repeated trials, and reſolute perſeverance, Mr. Dollond ſucceeded ſo far as to conſtruct refracting teleſcopes, much ſuperior to any that had before been uſed, repreſenting objects with great diſtinctneſs, and in their true colors. Mr. Clairaut, who intereſted himſelf betimes in this diſcovery, endeavoured to aſcertain the principles of Mr. Dollond's theory, and to lay down rules for facilitating the conſtruction of theſe new teleſcopes. With this view he made ſeveral experiments, in order to determine the refractive powers of different kinds of glaſs, and the proportion in which they ſeparated the rays of light; and from theſe experiments he deduced ſeveral theorems and problems of general uſe. D'Alembert likewiſe made a great variety of calculations to the ſame purpoſe; and ſhewed how to correct the errors to which theſe teleſcopes are ſubject, by placing the object-glaſſes, in ſome caſes, at a ſmall diſtance from one another; and ſometimes by uſing eye glaſſes of different refractive powers. But though other nations were hereby ſupplied with the moſt accurate calculations, they were very defective in practice. The Engliſh teleſcopes, made, as they imagined, without any exact rule, were greatly ſuperior to the beſt of their conſtruction.

Mr. Euler, who firſt gave occaſion to this important and uſeful enquiry, was very reluctant in admitting Mr. Dollond's improvements, becauſe they militated againſt a preconceived theory of his own. At laſt, however, convinced of their reality and importance by M. Clairaut, he aſſented; and ſoon after received farther ſatisfaction from the experiments of M. Zeiher, of Peterſburgh, who demonſtrated, that it is the *lead* in the compoſition of glaſs which gives it this remarkable property; that, while the refraction of the mean rays is nearly the ſame, that of the extreme rays conſiderably differs; and by encreaſing the lead, he produced a kind of glaſs, which occaſioned a much greater ſeparation of the extreme rays than the flint glaſs which Mr. Dollond had made uſe of, and at the ſame time conſiderably encreaſed the mean refraction. M. Zeiher in the courſe of his experiments, made glaſs of minium and flint, with a mixture of alkaline ſalts; and found that this mixture greatly diminiſhed the mean refraction, without making hardly any change in the diſperſion; and at length obtained a kind of glaſs greatly ſuperior to the flint glaſs of Mr. Dollond for the conſtruction of teleſcopes; ſince it occaſioned *three* times as great a diſperſion of the rays as the common glaſs, while the mean refraction was only as 1.61 to 1.

In 1758, Mr. Dollond made a further improvement in teleſcopes, by introducing two object-glaſſes, one of crown glaſs, and one of flint. See Eng. Phil. Tranſ. vol. i. p. 735, 743; and vol. iv. p. 56. Hiſt. Ac. Par. 1756, p. 183, 624. Ditto 1767, p. 107. Swed. Mem. vol. xvi. p. 300. Ac. Berl. 1762, and 1766. For a further account of Mr.

Dollond's new refracting, or achromatic teleſcopes. See the article TELESCOPE.

ABERRATION of the planets, is equal to the geocentric motion of the planet, the ſpace it apppears to move during the time that light employs in paſſing from the planet to the earth. Thus in the ſun, the aberration in longitude is conſtantly 20″, that being the ſpace moved by the ſun, or which is the ſame thing as to its effects, by the earth, in the time of 8′ 7″, which is the time in which light paſſes from the ſun to the earth. In like manner, knowing the diſtance of any planet from the earth, by proportion it will be, as the diſtance of the ſun is to the diſtance of the planet, ſo is 8′ 7″ to the time of light paſſing from the planet to the earth; then computing the planet's geocentric motion in this time, that will be the aberration of the planet, whether it be in longitude, latitude, right aſcenſion or declination.

Circle of ABERRATION, is a luminous circle, ſurrounding the real diſk of the ſun, and depending on the *aberration* of the ſolar rays, whereby his apparent diameter is enlarged.

ABERYSTWITH, a market town of Cardiganſhire, in Wales, ſeated on the Ridal, near its confluence with the Iſtwith, where it falls into the ſea. Its diſtance from London is 199 miles weſt-ſouth-weſt. E. Long. 70, 45. N. Lat. 52, 30.

ABESTA, or AVESTA, the name of one of the ſacred books of the Perſian Magi; which they attribute to their great founder Zoroaſter, or Zerduſht. The Abeſta is a commentary or expoſition of two other of their religious books, called Zend and Pazend; the three together include the whole ſyſtem of the *ignicolæ* or worſhippers of fire. According to Du Perron, the *Aveſto* ſignifies the language of the Oriental text of Zoroaſter's works. Hiſt. Ac. Sc. Paris 1762.

ABETTOR, or ABBETTOR, in law, one who incites or encourages another to perform ſomething criminal; or by ſome way aſſiſts him in the performance itſelf. Thus thoſe who procure others to ſue out falſe appeals of felony, or murder, againſt men, to render them infamous, are particularly denominated *abettors*. So *abettors* in *murder* are ſuch as adviſe or procure a murder to be committed, or are acceſſary thereto. There are *abettors* in *felony*, but not in *treaſon*; the law looking on all thoſe concerned in treaſon as principals. It is the ſame with art and part in Scotch Law.

ABEYANCE, or ABBAYANCE, in law, the expectancy of an eſtate: e. g. if lands are leaſed to one perſon as tenant for life, with reverſion to another for years, the remainder for years is in abeyance till the deceaſe of the leſſee. It is a maxim in law, that of every land, either there is a fee ſimple in ſomebody, or it is in *abeyance*.

ABEX, a country in High Ethiopia, in Africa, bordering on the Red Sea, by which it is bounded on the eaſt. It has Nubia or Sennar on the north; Sennar and Abyſſinia on the weſt: and Abyſſinia on the South. Its principal towns are Suaquem and Arkeko. It is ſubject to the Turks, and has the name of the Beglerberg of Habeleth. It is 500 miles in length and 100 in breadth, and is a wretched country; for the heat here is almoſt inſupportable, and the air is ſo unhealthy, that an European cannot ſtay long there without the utmoſt hazard of his life. It is very mountanous, inſomuch that there are many more wild beaſts than men. Its mountains are inacceſſible which ſecure it from the inroads of the Abyſſians. There are foreſts, in which grow a great many ebony trees, &c.

ABGAR, or ABGARUS, a name given to ſeveral of the kings of Edeſſa in Syria. The moſt celebrated of them is one who, it is ſaid, was cotemporary with Jeſus Chriſt; and who having a diſtemper in his feet, and hearing of Jeſus's miraculous cures, requeſted him by letter, to come and cure him. Euſebius, who believed that this letter was genuine, and alſo an anſwer our Saviour is ſaid to have returned to it, has tranſlated them both from the Syriac, and aſſerts that they were taken out of the archives of the city of Edeſſa. The firſt is as follows: "Abgarus, prince of Edeſſa, to Jeſus the holy Saviour; who hath appeared in the fleſh in the confines of Jeruſalem, greeting. I have heard of thee, and of the cures thou haſt wrought without medicines or herbs. For it is reported thou makeſt the blind to ſee, the lame to walk, lepers to be clean, devils and unclean ſpirits to be expelled, ſuch as have been long diſeaſed to be healed, and the dead to be raiſed; all which when I heard concerning thee, I concluded with myſelf, That either thou waſt a God come down from heaven, or the Son of God ſent to do theſe things. I have therefore written to thee, beſeeching thee to vouchſafe to come unto me, and cure my diſeaſe. For I have alſo heard that the Jews uſe thee ill, and lay ſnares to deſtroy thee. I have here a little city, pleaſantly ſituated, and ſufficient for us both. ABGARUS." To this letter, Jeſus, it is ſaid, returned an anſwer by Ananias, Abgarus's courier, which was as follows: "Bleſſed art thou, O Abgarus! who haſt believed in me whom thou haſt not ſeen; for the ſcriptures ſay of me, They who have ſeen me have not believed in me, that they who have not ſeen, may, by believing, have life. But whereas thou writeſt to have me come to thee, it is of neceſſity that I fulfill all things here for which I am ſent; and having finiſhed them, to return to him that ſent me: but when I am returned to him, I will then ſend one of my diſciples to thee who ſhall cure thy malady, and give life to thee and thine. JESUS." After Jeſus's aſcention, Judas, who is alſo named Thomas, ſent Thaddeus, one of the ſeventy, to Abgarus; who preached the goſpel to him and his people, cured him of his diſorder, and wrought many other miracles; which was done, ſays Euſebius, A. D. 43.—Though the above letters are acknowledged to be ſpurious by the candid writers of the church of Rome, ſeveral Proteſtant authors, as Dr. Parker, Dr. Cave, and Dr. Grabe, have maintained that they are genuine, and ought not to be rejected.

ABIANS, anciently a people of Thrace, or (according to ſome authors) of Scythia. They had no fixed habitations, but led a wandering life. Their houſes were waggons, which carried all their poſſeſſions. They lived on the fleſh of their herds and flocks, on milk, and cheeſe, chiefly on that of mare's milk. They were unacquainted with commerce. They only exchanged commodities with their neighbours. They poſſeſſed lands, but did not cultivate them. They aſſigned their agriculture to any who would undertake it, reſerving only to themſelves a tribute; which they exacted, not with a view to live in affluence, but merely to enjoy the neceſſaries of life. They never took arms, but to oblige thoſe to make good a promiſe to them by whom it had been broken. They paid tribute to none of the neighbouring ſtates. They deemed themſelves exempt from ſuch an impoſition; for they relied on their ſtrength and courage, and conſequently thought themſelves able to repel any invaſion. The Abians, we are told, were a people of great integrity. This honorable eulogium is given them by Homer. Strabo.

ABIATHAR, high-prieſt of the Jews, ſon to Abimelech, who had borne the ſame office, and received David, into his houſe. This ſo enraged Saul, who hated David, that he put Abimelech to death, and 81 prieſts; Abiathar alone eſcaped the maſſacre. He afterwards was high-prieſt, and often gave king David teſtimonies of his fidelity, particularly during Abſalom's conſpiracy, at which time Abiathar followed David, and bore away the Ark. But he after this, conſpired with Adonijah, in order to raiſe him to the throne of king David his father; this ſo exaſperated Solomon againſt him, that he diveſted him of the prieſthood, and baniſhed him, A. M. 3021, before Chriſt 1014.

ABIB, ſignifying an ear of corn, a name given by the Jews to the firſt month of their eccleſiaſtical year, afterwards called *Niſan*. It commenced at the vernal equinox, and, according to the courſe of the moon, by which their months were regulated, anſwers to the latter part of our March and beginning of April.

ABIDING *by writings*, in Scots law: When a perſon founds upon a writing alledged to be falſe, he may be obliged to declare judicially, whether he will ſtand or abide by it as a true deed. As to the conſequence of abiding by, or paſſing from, a falſe deed, ſee LAW.

ABIES, the Fir tree, a genus of evergreens; the characters of which are, there are male and female flowers of the ſame tree; the male flowers have empalements of four leaves without petals, many ſtamina, and naked ſummits. The female flowers are collected in a ſcaly cone, each ſcale covering two flowers, having neither petals or ſtamina, with one pointal, and are each ſucceeded by a winged nut. The diſtinguiſhing character of this genus, is the leaves ariſing ſingly from their baſe; whereas the Pines have two or more ariſing from the ſame point.

The Fir has always been ſeparated from the Pine-trees, by all writers on botany before Dr. Linnæus; and were generally diſtinguiſhed therefrom by their leaves being produced ſingly on the branches; the leaves of the Pine being produced by pairs, threes, or fives, out of ſheaths which ſurround their baſe. And as this diſtinction is now well known among the nurſery-gardeners, it is much better to keep them ſeparate, than to join them, with the cedar of Libanus and larch-tree, to the Pine, as the doctor has done, making them of one genus; eſpecially as the culture of them is very different. See PINUS.

The following deſcriptions will ſhow the different ſpecies:

1. Picea, or the ſilver or yew-leaved fir, grows naturally in many parts of Germany, but the fineſt trees of this ſort are growing upon mount Olympus. The Straſburgh turpentine is drawn from this tree. The wood is white and ſoft, and therefore not greatly eſteemed. 2. Alba, or the ſpruce or Norway fir, ſometimes called the pitch tree, grows naturally on the low lands of Sweden, Norway, and Denmark, or the mountains of Scotland; as alſo in many other parts of Europe. The wood is very light, white, rots in the air, and crackles in the fire. It is uſed for making muſical inſtruments, packing-boxes, &c. The Laplanders make ropes of the roots, and employ them for faſtening together the thin planks of their portable canoes. The inhabitants of Canada prepare a pleaſant and wholeſome liquor from the leaves. 3. Balſamea, or the Balm of Gilead fir, ſo nearly reſembles the picea, as ſcarcely to be diſtinguiſhed from it after it is grown to a large ſize. 4. Canadenſis, or the ſmall-coned American ſpruce fir, grows naturally in many parts of North-America, from whence the cones have been brought to England. The leaves are ſhorter than thoſe of the ſpruce fir, but like them in ſhape; the cones are looſe, and about an inch in length. 5. The Newfoundland ſpruce, is a native of Newfoundland and ſeveral other parts of North America; where the inhabitants make three ſorts of it, by the titles of Black, White, and Red ſpruce. 6. Americana, or the American hemlock fir, is alſo a native of the ſame country: and in the northern parts grows to be a very large tree; but in Britain the branches ſpread wide every way, ſo that there is no appearance of the trees ever arriving to any conſiderable height. The leaves are ſhort, and ſhaped very like thoſe of the yew-tree; they are ranged on two ſides of the branches only; ſo they appear flat, like thoſe of the ſilver fir; but are of a pale green on both ſides. The cones are ſmall, looſe, and roundiſh. From moſt of theſe firs, the inhabitants of North America collect a clear fragrant turpentine, which they uſe for curing green wounds; and the phyſicians there make great uſe of it internally.

All the ſorts of fir are propagated by ſeeds. The time for ſowing them is about the middle of March, when the ſeaſon is mild; otherwiſe it had better be deferred till the end of that month, or the beginning of April. The ſeeds which are preſerved in their cones, will keep good much longer than thoſe which are taken out; but the cones of the ſilver and balm of Gilead firs generally fall to pieces in the autumn, ſoon after the ſeeds are ripe; ſo that if they are not carefully watched, and gathered at that time, the ſeeds will be loſt. The cones of all the ſorts of fir open with more eaſe than thoſe of the pines, and require but little trouble to get out their ſeeds. If they are ſpread on a cloth before a fire for a few hours, their ſcales will open and emit the ſeeds. They may be ſown in pots or boxes filled with light freſh earth, and covered over about half an inch thick with the ſame earth: theſe ſhould be placed to an eaſt aſpect, where they may have the ſun till eleven in the morning. Or if the ſeeds are ſown in a bed of earth, it ſhould be ſhaded with mats in the middle of the day; for when they are too much expoſed to the ſun, the ſurface of the ground will dry ſo faſt (eſpecially in dry ſeaſons) as to hinder the ſeeds from vegetating, and when the plants begin to appear, if they are not ſcreened from the ſun, many of them will be ſoon deſtroyed. The ſeeds muſt be carefully guarded againſt mice and birds, who are very fond of them, but particularly when the plants begin to appear; for as they thruſt up the cover of the ſeeds on their top, the birds, in pecking off theſe covers, deſtroy the young plants; therefore the ſureſt method is to cover them with nets until the plants have thrown off their huſks and expanded their ſeed leaves, ſoon after which they will be out of danger. After the plants have remained in the ſeed-bed one year, they may be tranſplanted into beds in rows at five or ſix inches diſtance, and the plants in the rows four inches aſunder. They muſt be carefully weeded; and, if the ſeaſon proves very dry, it will be of ſervice gently to ſprinkle them over with water once or twice a week during the hot time of the year. When they have grown two years in theſe beds, they may then be tranſplanted into the nurſery, placing them in rows at three feet diſtance, and in the rows a foot aſunder. The beſt ſeaſon for removing them is in April, juſt before they begin to ſhoot. The ſmaller theſe trees are planted out when they are to remain, the greater will be their progreſs, and they will grow to a much larger ſize than thoſe that are moved at a much greater age. The wood of all the ſorts of fir yet known, being much inferior to that of the pine, it is uncommon to make plantations of them for their timber, but to cultivate them in pleaſure grounds for ornament. With this view, they ſhould be placed ſo far aſunder as to admit the free air between them; otherwiſe the lower branches will decay, and render the trees unſightly. The great beauty of theſe trees is their pyramidal form, and their being furniſhed with lateral branches, from about ſeven feet above the ſurface of the ground to the top. Theſe branches ſhould be well garniſhed with leaves; to obtain which, the trees ſhould not be planted nearer than 18 or 20 feet; for when they are cloſer planted, the under branches ſoon drop their leaves, and totally decay. The unſkilful diſpoſition of theſe trees has brought them into diſrepute with many perſons: whereas, if properly placed, they may be made very ornamental to fine ſeats.—In pruning off the under branches to the deſigned height, there muſt be care taken not to cut off too many at the ſame time; one tier being enough to be diſplaced in a year. The beſt time for this operation is in the beginning of September. The American ſpruce firs, planted in light moiſt ground, grow to a large ſize, and make a beautiful appearance; and if they are allowed room for their lower branches to ſpread and extend, they will be garniſhed with them almoſt to the ground, forming themſelves in a pyramidal figure. For the medical uſes of certain ſpecies of the Abies, ſee MATERIA MEDICA.

ABILITY is uſed, in law, for a capacity of doing certain things, relating either to the acquiſition of property, or the transferring of it. *Ability* in this ſenſe coincides with *capacity*, and ſtands oppoſed to *diſability* or *non-ability*. Every perſon is ſuppoſed to be *able*, i. e. to have the power of taking and diſpoſing of effects, whom the law does not diſable. Children of citizens of the United States born beyond the ſea may inherit the goods of their fathers, and this is called *ability*.

AB-INTESTATE, in the civil law, is applied to a perſon who inherits from one died inteſtate.

ABIPONIANS, a tribe of American Indians, who formerly inhabited the diſtrict of *Chaks* in Paraguay; but they have been obliged by the Spaniards to remove ſouthward into the territory lying between Santa Fe and St. Jago. The lateſt account publiſhed concerning this people is that of Mr. Dobrixhoffer, in 1785, who lived ſeven years among them. He eſtimates the nation at 5000 perſons, and attributes this limited population to the jealouſy of the women, who deſtroy their offspring, leſt the huſbands ſhould take other mates during the long period of two years which they ſuckle their children. They are a ſtrong hardy race of people; marry very late, rarely before the thirtieth year. The women are nevertheleſs celebrated for chaſtity. They have no idea of a deity, nor of numbers beyond three.

ABINGDON, a poſt-town in Waſhington-counry, in the ſouth weſtern diſtrict of Virginia. It contains about 160 houſes, a Preſbyterian church, a Court-honſe, a Jail, &c. It is pleaſantly ſituated near the juction, of the middle and ſouthernmoſt branches of Holſtein river, to which it has a navigation for boats of conſiderable ſize—It is very healthy and pleaſantly ſituated, and bids to be a place of conſiderable importance, as the courts for the county are held in it; in its vicinity is a curious cave arched by a natural rock, on the north ſide of the hill, on which the town is built; it has many different apartments, and through it a ſmall ſtream conſtantly runs in which ſome fiſh are found; It is upwards of 110 feet deep. Alſo, a curious ſpring which ebbs and flows every hour, the noiſe of its flowing can be heard ſometimes before the water can be ſeen. Abingdon is upwards of 500 miles S. W. or Philadelphia, and 320 W. by S. of Richmond in W. Long. 5, 30. N. Lat. 36, 40. There are two townſhips of the ſame name, the largeſt of which is in Plymouth county, Maſſachuſetts; it contains about 1500 inhabitants, and is about 20 miles S. E. of Boſton. The other is in Montgomery county, Pennſylvania, about 12 miles N. of Philadelphia.

ABINGDON, a town of Harford county, Maryland, containing about 506 inhabitants, including Blacks. W. Long. 1, 19. N. Lat. 39, 30.

ABINGDON, a market-town in Berkſhire, ſeated on a branch of the Thames, received its name from an abbey anciently built there. It is ſix miles and a half ſouth of Oxford, forty-ſeven eaſt of Glouceſter, and fifty-five weſt of London. E. Long. 74, 40. N. Lat. 51.

ABITIBBE, a ſmall lake in Upper Canada, from which flows a river of the ſame name, diſcharging itſelf into James's Bay. W. Long. 4, 26. N. Lat. 49.

ABJURATION, in our ancient cuſtoms, implied an oath, taken by a perſon guilty of felony, and who had fled to a place of ſanctuary, whereby he ſolemnly engaged to leave the kingdom for ever.

ABJURATION, is now uſed to ſignify the renouncing, diſclaiming, and denying upon oath, the Pretender to have any kind of right to the crown of England.

ABJURATION in the United States, is an oath taken by a foreigner, when he is admitted as a citizen, wherein he renounces all allegiance to any foreign potentate, prince, or ſtate, particularly that from whence he laſt came.

ABLACTATION, or weaning a child from the breaſt, if the mother or nurſe has enough of milk, a child will need little or no other food before the ſecond or third month of its age; when it will be proper to give it, once or twice a day a little water-pap; and as it grows older, it may be fed oftener, and have its panada ſometimes mixed with milk. This will accuſtom the child by degrees to take food and will render the weaning both leſs difficult and leſs dangerous. Weaning, unleſs when ailments, weakneſs, or ſuch like circumſtances, forbid, ought generally to take place about the ſixth or ſeventh month, at fartheſt by the ninth or tenth. The child ought then to be fed four or five times a-day; but ſhould never be accuſtomed to eat in the night. The food ſhould be ſimple and light; not ſpoiled with ſugar, wine, and ſuch like additions, for they produce the diſeaſes that children are moſt troubled with. Unfermented flour makes a viſcid food that turns ſour before it digeſts, and well fermented bread ſoon turns ſour; but if the panada made of this latter be given new, the inconvenience of ſouring is prevented. To prevent acidity in the child's ſtomach by a daily uſe of vegetable food, give now and then a little freſh broth, made from either veal, mutton, or beef. Rice is not ſo apt to turn ſour as wheat bread is; it therefore would be a more convenient food for children, and deſerves to be attended to. Toaſted bread boiled in water till it is almoſt dry, then mixed with freſh milk not boiled, is an agreeable change. As the teeth advance, the diet may increaſe in its ſolidity. As to the quantity, let the appetite be the meaſure of it; obſerving to ſatisfy hunger, but no more; which may be thus managed. Feed the child no longer than it eats with a degree of eagerneſs; but children may at all times be allowed good light bread to chew as much as they pleaſe. Butter ought by all means to be denied them; as it both relaxes the ſtomach and produces groſs humors. In place of this, let them be uſed as early as poſſible with honey; which is cooling, cleanſing, tends to ſweeten the humors, prevents or deſtroys worms, and renders children leſs ſubject to ſcabbed head and other cutaneous diſorders. In feeding, let the child be held in a ſitting poſture, and that until the ſtomach has nearly digeſted its contents; the too common practice of violently dancing and ſhaking the child ſhould be avoided. Divert it during the day as much as poſſible, which will make it ſleep ſound all the night. Never awaken a child when it is aſleep, for thus ſickneſs and previſhneſs are often produced.

Ablactation, in the ancient agriculture, is a method of engrafting; wherein the ſcyon of one tree, being united for ſome time to the ſtock of another, is afterwards cut off and, as it were, weaned from its mother-tree. Among the modern writers, *ablactation* is more uſually called INARCHING OR GRAFTING *by approach*. See FRUIT GARDEN. MONTH of FEBRUARY.

Ablactation is only practicable where the ſtock to be grafted on, and the tree from which the graft is to be taken, ſtand ſo near, that the branch or ſcyon may be applied without cutting off. Hence it is chiefly uſed on plants that grow in caſes; orange, lemon, pomegranate trees; vines, jaſſamins, &c. The ſeaſon to perform it in, is April or May; in the Southern ſtates earlier in the ſpring. To perform it, the uſual method is to pare away the rind and the wood of the branch intended to be grafted the length of thee inches; then parting likewiſe the ſtock, ſo that they may be joined to each other, they are bound together and covered over with clay or grafting wax. As ſoon as they are found well incorporated together, the head of the ſtock is to be cut off; four inches above the binding; and the ſpring following the ſtock is bared and left to ſubſiſt like other trees. Or, the operation may be performed by cutting off the head of the ſtock at firſt, in a diagonal direction, ſo that the top may be ſloped, and the graft applied thereto, and dreſſed as in *ſhoulder-grafted*. But this method is not found equally ſucceſsful.

Ablactation alſo ſignifies any thing extracted from its original ſtate, and ſupported by ſome new ſource, ſo as to make its nature partake of other means to preſerve life than it originally poſſeſſed. This, however, is applied generally to the botanical ſyſtem.

ABLATIVE, in grammar, the ſixth caſe of Latin nouns, from *ablatio*, the act of taking away; or, according to others, from *auferre*, to take away. Priſcian calls it alſo the comparative caſe, becauſe in the Latin language it ſerves for comparing as well as taking away. It is oppoſed to the third or DATIVE caſe, which ſignifies giving. In the Engliſh, French, and other languages there is no certain mark by which this caſe can be diſcriminated. The prejudice and dogmatiſm of lexicographers and pedants, have combined to impoſe it as a rule in languages wherein it can be of no uſe, and for no other reaſon but becauſe it exiſts in the Latin. Thus in the two phraſes, *the magnitude of the city*, and *he ſpoke much of the city*, it is laid down, that *of the city* in the firſt phraſe is *genitive* and in the ſecond *ablative*, becauſe they would be ſo, if the two phraſes were expreſſed in Latin. This is one among many abſurdities which being ſuffered to remain in elementary works, ſerve only to confound the minds and diſcourage the efforts of youth. In the Engliſh language, unleſs we except the nominative and genetive, or poſſeſſive, which alone admit of terminations, there are properly no caſes. See GRAMMAR.

But even in the ancient languages, from which the notion of caſes is borrowed, it is ſuggeſted, that the *ablative* is only a ſort of ſupernumerary, or ſupplement to the reſt. The five proper caſes not being found ſufficient to expreſs all the relations of things to each other, recourſe was had to an expedient; viz. the putting a prepoſition before ſome of the other caſes, and this made the *ablative*. It may be added that, in the plural number, the *ablative* is ſtill more obſcure, as being only the dative repeated.

The queſtion concerning the Greek *ablative* has been the ſubject of a famous literary war between two great grammarians, Friſchlin and Cruſius: the former of whom maintained, and the latter oppoſed the reality of it. The diſpute is not decided to this day. Sanctius, and the Port-royaliſts, alſo maintained the affirmative; Perizonius the negative. The chief reaſon alledged by Sanctius is, that the Roman writers often joined Greek words with the Latin prepoſitions, which govern *ablative* caſes, as well as with nouns of the ſame caſe. To which Perizonius anſwered, that the Latins anciently had no *ablative* themſelves; but, inſtead thereof, made uſe, like the Greeks, of the dative caſe: till at length they formed an *ablative*, govered by prepoſitions, which were not put before the dative; that, at firſt, the two caſes had always the ſame termination, as they ſtill have in many inſtances; but that this was afterwards changed in certain words. It is no wonder then, that the Latins ſometimes join prepoſitions which govern an *ablative* caſe, or nouns in the *ablative* caſe, with Greek datives, ſince they were originally the ſame; and that the Greek dative has the ſame effect as the Latin *ablative*.

Ablative *abſolute*, in grammar, is a detached phraſe, independent of the reſt of a diſcourſe; and is much the ſame with the Engliſh parentheſis; e. g. *juvante Deo* (with God's aſſiſtance.) It is called *abſolute*, becauſe governed by no other word.

ABLUENTS, Abluentia, in medicine, a name which ſome authors give to a ſort of diluting remedies, better known by the name of Abstergents, by ſome called Diluents.

ABLUTION, from *abluo*, quaſi *ab* and *lavo*, I waſh away; in antiquity, a religious ceremony in uſe among the Romans; being a ſort of purification, performed by waſhing the body before they entered on ſacrifice. Sometimes they waſhed their hands and feet, ſometimes the head, and oftentimes the whole body; for which purpoſe at the entrance into their temples, were placed marble veſſels filled with water. The Romans uſed to waſh the feet of new married women, as an emblem of the purity required of them in marriage. If a man committed murder, or any other act of violence, he was not allowed to approach the altar till he had waſhed himſelf. Ovid juſtly ridicules this notion:

> Ah nimium faciles, qui triſtia crimina cædis
> Flumineâ tolli poſſe putatis aquâ.
> Ah credulous! who think, when blood is ſpilt,
> The running ſtream can waſh away the gilt.

But ablution was not always performed by bathing; they ſometimes made uſe of aſperſion, or ſprinkling with water, which was done with a branch of olive, laurel, or an inſtrument made on purpoſe, and named, from its uſe, *aſpergillum*.

> Idem ter ſocios pura ciæumtulit unda,
> Spargens rore levi, et ramo felicis Olivæ.
> Old Choriœus compaſs'd thrice the crew,
> And dipp'd an olive branch in holy dew,
> Which thrice he ſprinkled round. Dryden.

But the more auguſt myſteries, ſuch as thoſe of Ceres, required *ablution*, or dipping of the whole body; and the oracle of Trophonius could not be conſulted, till a man had firſt dipped himſelf ſeveral times in the river Hercyna. Æneas dared not handle ſacred things till he had purged himſelf by a proper *ablution*.

> Tu, genitor, cape ſacra manu patrioſque penates;
> Me bello e tanto digreſſum, et cæde recenti,
> Attractare nefas, donec me flumine vivo
> Abluero.
> Thou, thou, my ſire, our gods and relics bear:
> Theſe hands, yet horrid with the ſtains of war,
> Refrain their touch, unhallow'd, till the day
> When the pure ſtream ſhall waſh the guilt away.

Ablutions appear to be as old as any ceremonies, and external worſhip itſelf. The Jewiſh religion required continual ablutions or waſhing; and we read that Moſes was commanded "to make a laver of braſs for Aaron and his ſons to waſh their hands and face in, when they went into the tabernacle of the congregation." But as people accuſtom themſelves to regard things appointed for ſacred uſes with a kind of ſuperſtitious awe, this very practice, which was only intended as a ſign of inward purity, at length became the eſſential part of their religion; an error with which Jeſus Chriſt reproached the Jews. Thus it appears, ſay ſome Chriſtian writers, that Moſes enjoined ablution; the heathens adopted them, and Mahomet and his followers continued them; thus they have got footing among moſt nations, and make a conſiderable part of moſt eſtabliſhed religions.

Ablutions, nevertheleſs, owe their origin to a more ancient ſource. The cuſtom of ablution in warm countries is eſſential in cleanlineſs and health, where the luxurious habits of indolent indulgence are too apt to prevail over remote advantages, which are to be obtained by exertion; thence it appears to have been introduced by wiſe legiſlators, or lawgivers, among the religious duties. The Bramins of India, and all the numerous inferior caſts, perform certain ablutions at ſtated periods in every day. The Bramins muſt bathe their whole bodies before they eat, when they eat, and before they retire to reſt. The *Shastah* obliges them to undergo an ablution after the nuptial rite. Both ſexes practiſed this ablution, and have a high veneration for the waters of the Ganges. But as they cannot at all times be near enough to waſh themſelves in the ſacred waters, the Bramins tell thoſe ſo ſituated, that other waters will have the ſame virtue, if, whilſt bathing, they pronounce certain words. The Egyptians ſeem to have borrowed this, along with others of their religious inſtitutions, from the Aſiatics, for prieſts had their diurnal and nocturnal ablutions; the Grecians their ſprinkling; the Romans their luſtrations and lavations; the Jews their waſhing their hands and feet, beſides their baptiſm; the ancient Chriſtians had their ablutions before communion, which the Romiſh church ſtill retains before their maſs, ſometimes after; the Syrians, Copts, &c. have their ſolemn waſhings on Good Friday; the Turks their greater and leſſer ablutions; their *gass* and *wodon*; their *aman*, *tabarut*, *gusul*, *abdest*, &c.

From the eſtabliſhment of the cuſtom under the ſanction of religion, the tranſition to a ſymbol of purity was neither difficult nor unreaſonable, and hence it had been diffuſed through all ancient religious inſtitutions, even where the ſame motives to frequent ablution did not exiſt.

However whimſical theſe ablutions may appear to the unreflecting, it ſtrongly marks the wiſdom of the inſtitutors. And even in cold and temperate climates, few things would tend more to prevent diſeaſe than a frequent practice of them. Were every perſon, for example, after viſiting the ſick, handling a dead body, or touching any thing that might convey infection, to waſh before he went into company or ſat down to meat, or would run leſs hazard of catching the infection himſelf, or of communicating it to others. Whence does it ariſe that the Aſiatics and Africans have ſuch fine teeth, and that in our cities, the fair ſex eſpecially, rarely poſſeſs fine teeth, or for any length of time?—It is owing to the ablution of the mouth after meals by the former, and to the neglect of it by the latter.

Frequent waſhing not only removes the filth and ſordes which adhere to the ſkin, but likewiſe promotes the perſpiration, braces the body, and enlivens the ſpirits. The cuſtom of waſhing the feet, though leſs neceſſary in cold climates, is nevertheleſs a very agreeable piece of cleanlineſs, and contributes greatly to the preſervation of health. This piece of cleanlineſs would often prevent colds and fevers. Were people careful to bathe their feet and legs, in luke warm water, at night, after being expoſed to cold or wet through the day, they would ſeldom experience the bad effects which proceed from theſe cauſes. The *Armenians*, who are the quakers of the eaſt, are the moſt healthy people in Aſia, and attribute this happineſs to the conſtant uſe of the hot baths.

Ablution is particularly uſed, in the Romiſh church, for a cup of wine and water, which the communicants anciently took after the hoſt, to waſh it down, and help to digeſt it. The ſame term alſo ſignifies the water which ſerves to waſh the hands of the prieſt who conſecrated it.

Ablution, in pharmacy, is a preparation which divers remedies undergo, by waſhing them in water, or ſome other fluid, proper to cleanſe or free them of their impurities, and ſo to exalt their powers. The uſual way of doing this is by *cohobation*, or pouring the liquor diſtilled from the body upon it again; and repeating this as often as it is neceſſary. *Ablution* is ſometimes alſo uſed, though with leſs propriety, for waſhing or infuſing certain medicines in water, to freſhen them, and diſſolve their ſalts.

ABNOBA, now Abenow, a long range of mountains in Germany, taking different names according to the different countries they run through. As about the river Maine, called the *Oden* or *Ottenwald*; between Heſſe and Franconia, the *Speſſart*; and abount the duchy of Wirtemberg, where the Danube takes its riſe, called the *Baar*.

ABO, a maritime town in Sweden: it is the capital of the province of Finland, and is ſeated in the gulph of that name, at the mouth of the river Autajoki. It is a good port; and is the ſee of a biſhop, ſuffragan of Upſal. It has alſo an univerſity, founded by queen Chriſtiana, in 1640. It lies 120 miles north-eaſt from Stockholm. E. Long. 96, 28. N. Lat. 60, 50.

ABOARD, the inſide of a ſhip. Hence any perſon who enters a ſhip is ſaid to *go aboard*; but when an enemy enters in the time of battle, he is ſaid to *board*; a phraſe which always implies hoſtility. To *fall aboard of*, is to ſtrike or encounter another ſhip when one or both are in motion, or to be driven upon a ſhip by force of the wind or current. *Aboard-main-tack*, the order to draw the main tack, *i. e.* the lower corner of the main-ſail, down to the cheſs-tree.

ABOLITION, Aboliſhing, in a general ſenſe, the act of deſtroying a thing or reducing it to nothing. Some derive the word from *abolere* ex *ab* in *oleo*, and others from the Greek *apollew*, *I deſtroy*.

In the laws of the United States, the *abolition* of a law, ſtatute, or cuſtom, is the abrogating or repealing it.

Abolition is particularly uſed among civilians for remitting the puniſhment of a crime. The abolition of the ſlave trade. See Society.

ABOLLA, a warm kind of garment, lined or doubled, worn by the Greeks and Romans, chiefly out of the city, in following the camp.

ABOMASUS, Abomasum or Abomasium, in comparative anatomy, one of the ſtomachs or ventricles of animals of the ruminating kind. See Ruminant and Rumination. Beaſts that chew their cuds are found to have four ſtomachs; viz. the *rumen*, or *magnus venter*, or *ſtomach*, properly ſo called; the *reticulum*, *omaſus* and *abomaſus*. The *abomaſus*, properly called the *maw*, is the laſt of the four, being the place where the chyle is formed, and from which the food deſcends immediately into the inteſtines. It is full of a ſort of leaves like the *omaſus*; but its leaves have this peculiarity, that beſides the membranes they conſiſt of, they contain a great number of glands, not found in any of the firſt. It is in the *abomaſus* of calves and lambs the rennet, or earning, is formed, wherewith houſewives curdle their milk, and which are ſo neceſſary in making of cheeſe.

ABOMINATION, a term uſed in ſcripture with regard to the Hebrews, who being ſhepherds, are ſaid to have been an abomination to the Egyptians, becauſe they ſacrificed the ſacred animals of that people, as oxen, goats, ſheep, &c. which the Egyptians eſteemed as abominations, or things unlawful. The term is alſo applied, in the ſacred writings, to idolatry and idols, becauſe the worſhip of idols is in itſelf an abominable thing; and, at the ſame time, ceremonies obſerved by idolaters were always attended with licentiouſneſs, and other odious and abominable actions. The *abomination of deſolation*, foretold by the prophet Daniel, is ſuppoſed to imply the ſtatue of Jupiter Olympus, which Antiochus Epiphanes cauſed to be placed in the temple of Jeruſalem. And the *abomination of deſolation* mentioned by the Evangeliſt, ſignifies the enſigns of the Romans during the laſt ſiege of Jeruſalem by Titus, on which the figures of their gods and emperors were embroidered, and placed upon the temple after it was taken.

ABORIGINES, or Aberrigines, in geography, a name given to the primitive inhabitants of a country, or thoſe who had their original therein; in contradiction to colonies, or new races of inhabitants, derived from other places. The term *Aborigines* is famous in antiquity. Tho' now an appellative, it was originally a proper name given only to a certain people of Italy. *Aborigines* then denoted a nation in Italy, which inhabited the ancient Latium, or country latterly called Romania, or Campagna di Roma; In this ſenſe the *Aborigines* are diſtinguiſhed from the *Janigenae*, who, according to the falſe Beroſus, inhabited the country before them; from the Siculi, whom they expelled; from the Grecians, from whom they deſcended; from the Latins, whoſe name they aſſumed, after their union with Æneas and the Trojans; and laſtly, from the Auſonii, Volſci, Oenotrii, &c. with neighbouring nations in other parts of the country. Whence this people came by the appellation, is much diſputed. St. Jerome ſays, they were ſo called as being *abſque origine*, the primitive planters of the country. Others think them ſo called, as being originally Arcadians, who claimed to be earth-born, and not deſcended from any people. Aurelius Victor ſuggeſts another opinion, viz. that they called *Aborigines*, q. d. *Aberrigines*, from *ab*, "from," and *errare*, "to wander;" as having been before a wandering people. Pauſanias rather thinks they were thus called *apo oreſi*, from "mountains;" which opinion ſeems confirmed by Virgil, who, ſpeaking of Saturn, the legiſlator of this people, ſays,

> *Is genus indocile ac diſperſum montibus altis*
> *Compoſuit, legeſque dedit*. . . . .
> He the rude tribes from lofty mountains drew,
> Formed them to ſocial arts, and gave them laws:

The Aborigines were either the original inhabitants of the country ſettled there by Janus, as ſome imagine, or by Saturn, or Cham, as others, not long after the diſperſion, or even, as ſome think, before it; or they were a colony ſent from ſome other nation, who, expelling the ancient inhabitants, the Siculi, ſettled in their place. About this mother-nation there is great diſpute. Some maintain it to be the Arcadians, parties of whom where brought into Italy at different times: the firſt under the conduct of Oenotrius ſon of Lycaon, 450 years before the Trojan war; a ſecond from Theſſaly; a third under Evander, 60 years before the Trojan war; beſides another under Hercules; and another of Lacedæmonians, who fled from the ſevere diſcipline of Lycurgus: all theſe uniting, are ſaid to have formed the nation of the Aborigines. Others will have them of barbarian rather than Grecian origin, and to have come from Scythia; others from Gaul. Laſtly, ſome will have them to be Canaanites expelled by Joſhua. The *aborigines* of the United States. See **Indians**.

ABORTION, in midwifery, the birth of a fœtus before it has acquired a ſufficient degree of perfection to enable it to perform reſpiration and the other vital functions. For the treatment, &c. of Abortions, ſee **Midwifery**.

The practice of procuring abortions was prohibited by the ancient Greek legiſlators, Solon and Lycurgus. Whether or not it was permitted among the Romans, has been much diſputed. It is certain the practice, which was by them called *viceribus vim inferre*, was frequent enough; but whether there was any penalty on it, before the emperors Severus and Antonine, is the queſtion. Noodt maintains the nagitive; and further, that thoſe princes only made it criminal in one particular caſe, viz. of a married woman's practiſing it out of reſentment againſt her huſband, in order to defraud him of the comfort of children: this was ordered to be puniſhed by a temporary exile. The foundation on which the practice is ſaid to have been allowed, was, that the fœtus, while *in utero*, was reputed as a part of the mother, ranked as one of her own viſcera, over which ſhe had the ſame power as over the reſt: beſides, that it was not reputed as a man, *homo*; nor to be alive, otherwiſe than as a vegetable; conſequently, that the crime amounted to a little more than that of plucking unripe fruit ftom the tree. Seneca repreſents it as a peculiar glory of Helvia, that ſhe had never, like other women, whoſe chief ſtudy is their beauty and ſhape, deſtroyed the fœtus in the womb. The primitive fathers Athenagoras, Tertullian, Minutius Felix, Auguſtin, &c. declaimed loudly againſt the practice as virtual murder. Several councils have condemned it. We know of no modern Romiſh eccleſiaſtical laws which allow of diſpenſation for it. Egane mentions the rates at which a diſpenſation for it may be had.—In ſome countries, the procuring of abortions is ſtill ſaid not only to be allowed, but even enjoined by law; as among the Formoſans, if Mr. Pſalmanazar had been to be believed, who relates, that the women there, though married, are not allowed to breed before 35 years of age. When with child before that time, they are obliged to make themſelves abortive by force: to this end the prieſteſs (for in that country, according to him, the prieſtly office belongs to women) tramples on the patient's belly, till ſhe bring forth. But the extraordinary fabrications of this author are now well known.

The practiſe of artificial abortion is chiefly in the hands of women and nurſes, rarely in that of phyſicians; who, in ſome countries, are not admitted to the profeſſion without adjuring it. Hippocrates, in the oath he would have enjoined on all phyſicians, includes their not giving the *peſſus abortivus*; though elſewhere he gives the formal proceſs whereby he himſelf procured in a young woman a miſcarriage. The London edition of Hall's Encyclopædia has borrowed from the Supplement to Chambers's Dictionary, in which a detail is given of the various methods by which abortions may be procured. But we were unwilling to beſtow room upon information which it ſeemed equally uſeleſs and improper to propagate. It may, however, be obſerved, that often all the powers of art prove ineffectual; and no leſs often do the attempts prove the means of puniſhment by the fatal conſequences which they produce.

ABORTIVE *flux*, *fluxus abortivus*, is ſometimes uſed among the ancients, as ſynonymous with abortion or effluxion; viz. where the embryo loſes its hold, and ſlips away. In this ſenſe, the eagle-ſtone is celebrated for ſtopping abortive fluxes; for which end it was to be hung to the arm, *ſubnexus ſpem uteri defendit a fluxibus abortivis*.

Among modern phyſicians, abortive fluxes are chiefly underſtood of a kind of hæmorrhages, which ſometimes precede, and bring on, abortion; at other times burſt forth in the act of excluſion. The cauſe is a violent ſeparation of the ſecundines from the uterus; which may ariſe from a vehement fit of paſſion, or motion of the body; a fall, fright, or the like. Thunder, lightning, hot liquor, too liberal uſe of deobſtruents, or opiates, or the naval-ſtring being too ſhort, ſometimes occaſion an *abortive* hæmorrhage.

Abortive *corn*, a diſtemper of corn mentioned by the French œconomiſt Tillet, and ſuſpected to be occaſioned by inſects. It appears long before harveſt, and may be known by a deformity in the ſtalk, the leaves, the ear, and even the grain. For a copius account of the cauſes, of diſtempered corn, ſee the Syſtem of **Agriculture**.

ABOUT, the ſituation of a ſhip immediately after ſhe has *tacked*, or changed her courſe by going about and ſtanding on the other tack. *About-ſhip!* the order for the ſhip's crew to prepare for tacking.

ABOUTIGE, a town of Upper Egypt, in Africa, near the Nile, where they make the beſt opium in all the Levant. It was formerly a large, but now is a mean place. N. Lat. 26, 50.

ABRA, a ſilver coin ſtruck in Poland, and worth about 21 cents. It is current in ſeveral parts of Germany, Conſtantinople, Aſtracan, Smyrna, and Grand Cairo.

ABRACADABRA, a magical word, recommended by Serenus Samonicus as an antidote againſt agues and ſeveral other diſeaſes. It was to be written upon a piece of paper as many times as the word contains letters, omitting the laſt number of the former every time, as in the margin, and repeated in the ſame order; and then ſuſpended about the neck by a linen thread. *Abracadabra* was the name of a god worſhipped by the Syrians; ſo wearing his name was a ſort of invocation of his aid; a practice which, though not more uſeful, yet was leſs irrational, than is the equally heatheniſh practice among thoſe who call themſelves Chriſtians, of wearing various things in expectation

abracadabra
abracadabr
abracadab
abracada
abracad
abraca
abrac
abra
abr
ab
a

expectation of their operating by a Sympathy, whoſe parents were Ignorance and Superſtition.

ABRANTES, a town of Portugal, in Eſtremadura, ſeated on the river Tajo, belongs to a marquis of the ſame name. It ſtands high, is ſurrounded with gardens and olive-trees, and contains thirty-five thouſand inhabitants. It has four convents, an alms-houſe, and an hoſpital. E. Long. 67. 42. N. Lat. 39, 13.

ABRASA, ulcers attended with abraſion of part of the ſubſtance: or ulcers where the ſkin is ſo tender and lax as to be ſubject to abraſion.

ABRASION, is ſometimes uſed, among medicinal writers, for the act of wearing away the natural *mucus*, which covers the membranes, and particularly thoſe of the ſtomach, and inteſtines, by ſharp corroſive medicines or humours. The word is compoſed of the Latin, *ab*, and *rado*, to ſhave, or ſcrape off.

ABRAUM, in natural hiſtory, a name given by ſome writers, to a ſpecies of red clay, uſed in England by the cabinet-makers, &c. to give a red colour to new mahogany wood: they have it from the Iſle of Wight; but it is alſo found in Germany and Italy.

ABRASAX, or Abraxas, the ſupreme god of the Baſilidian ſectaries. It is a myſtical word, compoſed of the Greek numerals, *a*, *b*, *r*, *a*, *x*, *a*, *s*, which together make up the CCCLXV. For Baſilides taught, that there were 365 heavens between the earth and the empyrean; each of which heavens had its angel or intelligence, which created it; each of which angels likewiſe was created by the angel next above it; thus aſcending by a ſcale to the Supreme Being, or firſt Creator. The Baſilidians uſed the word *Abraxas* by way of charm or amulet.

Abraxas is alſo uſed, among antiquaries, for a ſpecies of graven gem, on which the word *abraxas* is uſually inſcribed; ſuppoſed to have been worn by the ancient Gnoſtics, Baſilidians and Carpocratians, as an amulet or taliſman againſt diſeaſes. Abraxas, in this ſenſe, is ſynonimous with *Baſilidian ſtone*, a name by which ſome authors call theſe antiquities; or *abraxean ſtone*, as they are denominated by others. They are of divers figures and ſizes; ſometimes in that of rings for the fingers.

Abraxaſes are frequent in the cabinets of the curious: a collection of them, as complete as poſſible has been much deſired by ſeveral. There was a fine one formerly in the abbey of St. Genevieve, which occaſioned much curioſity. They are chiefly of the third century; moſt of them ſeem to have come from Egypt, hence they became of conſiderable uſe for explaining the antiquities of that country. Some times they have no other inſcription beſides the word: but others have the name of ſaints, angels, or Jehovah himſelf annexed; though moſt uſually the name of the Baſilidian god. Sometimes their is a repreſentation of Iſis ſitting on a lobes, or apis, ſurrounded with ſtars; ſometimes monſtrous compoſitions of animals, obſcene images, Phalſi and Ithyfalli. The graving is rarely good, but the word on the reverſe is ſometimes ſaid to be in a more modern taſte than the other. The characters are uſually Greek, Hebrew, Coptic, or Hetrurian, and ſometimes of a mongrel kind, invented, as it would ſeem, to render their meaning the more inſcrutable. It is diſputed whether the Veronica of Montreuil, or the granite obeliſk mentioned by Gori, be *Abraxas*.

ABREAST, (a ſea term,) ſide by ſide, or oppoſite to; a ſituation in which two or more ſhips lie, with their ſides parallel to each other, and their heads equally advanced. This term more particularly regards the line of battle at ſea where, on the different occaſions of attack, retreat, or purſuit, the ſeveral ſquadrons or diviſions of a fleet are obliged to vary their diſpoſitions, and yet maintain a proper regularity, by ſailing in right or curved lines. When the line is formed *abreaſt*, the whole ſquadron advances uniformly, the ſhips being equally diſtant from and parallel to each other, ſo that the length of each ſhip forms a right angle with the extent of the ſquadron or line abreaſt. The commander in chief is always ſtationed in the centre, and the ſecond and third in command in the centres of their reſpective ſquadrons. *Abreaſt*, within the ſhip, implies on a line with the beam, or by the ſide of any object abroad; as, "the frigate ſprung a leak *abreaſt* of the main hatch-way;" *i. e.* on the ſame line with the main hatch-way, croſſing the ſhips length at right angles, in oppoſition to *afore* or *abaſt* the hatch-way. "We diſcovered a fleet *abreaſt* of Cape Henlopen;" *i. e.* off or directly oppoſite to it. See the Treatiſe of Naval Tactics.

ABBRETTENE, (Strabo;) Abrettine, (Stephanus;) a diſtrict of Miſſia, in Aſia. Hence the epithet *Abrettenus* given to Jupiter, (Strabo;) whoſe prieſt was Cleon, formerly at the head of a gang of robbers, and who received many and great favors at the hand of Antony but afterwards went over to Auguſtus. The people were called *Abretteni*; inhabiting the country between Ancyra of Phrygia, and the river Rhyndacus.

ABRIDGING, in algebra, is the reducing a compound problem, or equation, to its more ſimple expreſſion. See Problem and Equation. To prevent the mind from being diſtracted with attending to known quantities, concerning which nothing farther is required, and to keep the attention entire from the reſt, mathematicians uſe to *abridge* their equations, by expreſſing all the known qualities of the ſame term by a ſingle letter. For an inſtance, to *abridge* the equation

$$\begin{array}{llll} x3 & -axx & +abx & -abc=0 \\ & -b & +ac & \\ & -c & +bc & \end{array}$$

All the known quantities $-a-b-c$ of the ſecond term are oppoſed equal to one ſingle letter $-n$: all the known quantities $+ab+ac+bc$ of the third term, equal to another letter $+p$; and all the known quantities $-abc$ of the fourth term, equal to a ſingle letter $-p$. By which means we have $x3-nxx+px-q=0$, inſtead of the equation propoſed. An equation thus abridged is called a *formula*. See Formula, and the ſyſtem of Algebra.

ABRIDGEMENT, in Engliſh law, is particularly uſed for the ſhortening a count or declaration, ſubtracting ſome of the ſubſtance of it. A man is to *abridge his plaint* in aſſize, or a women her demand in an action of dower, when having put any lands therein, which are not in the tenure of the tenant or defendant; and nontenure, or the like, is pleaded to that land in the abatement of the writ; they are brought to *abridge*, *i. e.* to deſiſt from, and leave that parcel out of the demand; and pray that the tenant may anſwer to the reſt, to which he has not pleaded any thing. Though the demandant has *abridged* his plaint, or demand, yet the writ ſtill remains good for the reſt. The reaſon is that ſuch writs run in general, and do not ſpecify particulars.

ABRIDGEMENT, in literature, a term ſignifying the reduction of a book into a ſmaller compaſs.

The art of conveying much ſentiment in few words, is the happieſt talent an author can be poſſeſſed of. This talen is peculiarly neceſſary in the preſent ſtate of literature; for many writers have acquired the dexterity of ſpreading a few critical thoughts over ſeveral hundred pages. When an author hits upon a thought that pleaſes him, he is apt to dwell upon it, to view it in different lights, to force it in improperly, or upon the ſlighteſt relations. Although this may be pleaſant to the writers, it tires and vexes the reader. There is another great ſource of diffuſion in compoſition. It is a capital object with an author, whatever be the ſubject, to give vent to all his beſt thoughts. When he finds a proper place for any of them, he is peculiarly happy. But, rather than ſacrifice a thought he is fond of, he forces it in by way of digreſſion, or ſuperfluous illuſtration. If none of theſe expedients anſwer his purpoſe, he has recourſe to the margin, a very convenint apartment for all manner of pedantry and impertinence. Authors however correct, are generally more or leſs faulty in this reſpect. An abridger, however, is not ſubject to theſe temptations. The thoughts are his own; and he views them in a cooler and leſs affectionate manner; he diſcovers an impropriety in ſome, a vanity in others, and a want of utility in many. His buſineſs, therefore, is to retrench ſuperfluities, digreſſions, quotations, pedantry, &c. and to lay before the public only what is really uſeful. This is by no means an eaſy employment: To abridge ſome books, requires talents equal, if not ſuperior, to thoſe of the author. The facts, manner, ſpirit, and reaſoning, muſt be preſerved; nothing eſſential, either in argument or illuſtration, ought to be omitted. The difficulty of the taſk is the principal reaſon why we have ſo few good abridgments. Wynne's abridgment of Locke's Eſſay on the Human Underſtanding, is, perhaps, the only unexceptionable one in the Engliſh language.

Theſe obſervations relate ſoely to ſuch abridgments as are deſigned for the public. But,

When a perſon wants to ſet down the ſubſtance of any book, a ſhorter and leſs laborious method may be followed. It would be foreign to our plan to give examples of abridgments for the public: but as it may be uſeful, eſpecially to young people, to know how to abridge books for their own uſe, after giving a few directions, we ſhall exhibit an example or two, to ſhow with what eaſe it may be done.

Read the book carefully; endeavor to learn the principal view of the author; attend to the arguments employed. When you have done ſo, you will generally find, that what the author uſes as new or additional arguments, are in reality only collateral ones, or extenſions of the principal argument. Take a piece of paper, or a common-place book, put down what the author wants to prove, ſubjoin the argument or arguments, and you have the ſubſtance of the book in a few lines. For example,

In the Eſſay on Miracles, Mr. Hume's deſign is to prove, That miracles which have not been the immediate objects of our ſenſes, cannot reaſonably be believed upon the teſtimony of others.

Now, his argument (for there happens to be but one), is "That experience, which in ſome things is variable, in others uniform, is our *only* guide in reaſoning concerning matters of fact. A variable experience gives riſe to probability only; an uniform experience amounts to a proof. Our belief of any fact from the teſtimony of eye-witneſſes, is derived from no other principle than our experience in the veracity of human teſtimony. If the fact atteſted be miraculous, here ariſes a conteſt of two oppoſite experiences, or proof againſt proof. Now, a miracle is a violation of the laws of nature; and as a firm and unalterable experience has eſtabliſhed theſe laws, the proof againſt a miracle, from the very nature of the fact, is as complete as any argument from experience can poſſibly be imagined; and if ſo, it is an undeniable conſequence, that it cannot be ſurmounted by any proof whatever derived from human teſtimony."

In Dr. Campbell's Diſſertation on miracles, the author's principal aim is to ſhew the fallacy of Mr. Hume's argument; which he has done moſt ſucceſsfully by another ſingle argument, as follows:

"The evidence ariſing from human teſtimony *is not ſolely* derived from experience: on the contrary, teſtimony hath a natural influence on belief antecedent to experience. The early and unlimited aſſent given to teſtimony by children gradually contracts as they advance in life: it is, therefore, more conſonant to truth, to ſay, that our *diffidence* in teſtimony is the reſult of experience, than that our *faith* in it has this foundation. Beſides, the uniformity of experience, in favour of any fact, is not a proof againſt its being reverſed in a particular inſtance. The evidence ariſing from the ſingle teſtimony of a man of known veracity will go farther to eſtabliſh a belief in its being actually reverſed: If this teſtimony be confirmed by a few others of the ſame character, we cannot with-hold our aſſent to the truth of it. Now, though the operations of nature are governed by uniform laws, and though we have not the teſtimony of our ſenſes in favour of any *violation* of them; ſtill, if in particular inſtances we have the teſtimony of *thouſands* of our fellow-creatures, and thoſe too men of ſtrict integrity, ſwayed by no motives of ambition or intereſt, and governed by the principles of common ſenſe, That they were actually eye-witneſſes of theſe violations, the conſtitution of our nature obliges us to believe them."

Theſe two examples contain the ſubſtance of about 400 pages.——Making private abridgments of this kind has many advantages; it engages us to read with accuracy and attention; it fixes the ſubject in our minds; and, if we ſhould happen to forget, inſtead of reading the books again, by glancing a few lines we are not only in poſſeſſion of the chief arguments, but recall in a good meaſure the author's method and manner.

Abridging is peculiarly uſeful in taking the ſubſtance of what is delivered by Profeſſors, *&c.* Altho' it is poſſible, with the aſſiſtance of ſhort-hand writing, to take down, *verbatim*, what is ſaid by a public ſpeaker, yet ſuch a talent would be of little uſe, as they generally have circumlocutions, redundancies, and lumber, which deſerve not to be copied. All that is really uſeful may be comprehended in a ſhort compaſs. If the plan of the diſcourſe, and arguments employed in ſupport of the different branches, be taken down, you have the whole. Theſe you may afterwards extend in the form of a diſcourſe dreſſed in your own language. This would not only be a more rational employment, but would likewiſe be an excellent method of improving young men in compoſition, an object too little attended to in the education of youth.

ABROGATION, from the Latin *abrogo*, " I repeal," the act of aboliſhing a law, by authority of the maker. In which ſenſe the word is ſynonymous with *abolition*, *repealing* and *revocation*. *Abrogation* ſtands oppoſed to *rogation*. It is diſtinguiſhed from *derogation*, which implies the taking away only ſome part of a law ; from *subrogation*, which denotes the adding a clauſe to it ; from *obrogation*, which implies the limiting or reſtraining it : from *dispensation*, which only ſets it aſide in a particular inſtance ; and from *antiquation*, which is the refuſing to paſs a law.

ABSCESS, in ſurgery, a kind of inflammatory tumor, containing purulent matter, pent up in a fleſhy part, and corrupting and conſuming the fibres, and other ſubſtance thereof. *Abscess* is the ſame with what the Greeks call *apostemas*, and the Engliſh *imposthume* or *imposthumation*. Almoſt all *asbcesses* are the conſequences of inflammation. The ripening of *abscesses* is promoted by poultices, &c. *Abscesses* are opened either by cauſtic or inciſion ; but the latter way is in moſt caſes preferable. *Abscesses* ariſe often in women after delivery ; and though dangerous in themſelves, yet they often appear to be the criſis of the diſeaſe that gave riſe to them. For the cure, if they cannot be diſcuſſed, *i. e.* carried off by proper artificial evacuations, as phlebotomy, purging, &c. with the occaſional uſe of calomel, and gentle perſpirative fortuſes, liniments, and cataplaſms, recourſe is to be had to the contrary method, and they muſt be brought to ſuppuration.

Mr. Bell, in his treatiſe on ſurgery, obſerves, that when an abſceſs increaſes, and is attended with great pain, heat, and pulſation ; when the fever perſiſts obſtinately, and theſe ſymptoms continue for three days, notwithſtanding all endeavours for a reſolution, that intention is to be entirely laid aſide ; becauſe, if ſuch applications, as are proper to reſolve a humour, are continued when reſolution is no longer poſſible, the moſt fluid parts of the obſtructed humours will be diſſipated, and the more groſs and inactive particles dried and hardened, ſo as to prevent ſuppuration, or at leaſt to render it difficult ; in conſequence of which, a troubleſome induration of the part will remain ; or, if glandulous, a ſchirrus will be formed. Very different methods, therefore, ſhould be uſed, and the humour brought to maturation with the utmoſt expedition. The proper methods for promoting this intention are ſuch as increaſe the motion of the part, and have a tendency to excite a gentle fever, as fomentations and ſtimulating medicines. Such compoſitions alſo as confine the heat exerted in the part affected, by preventing an exceſſive perſpiration, are alſo proper. The ſimple aromatic gums, and the emolient, relaxing, and moiſtening medicines, are therefore proper for maturing the pus. This method muſt be purſued till the abſceſs has acquired a ſufficient degree of ripeneſs, which may be known by the ſoftneſs of the part, and the fluctuation of the matter in the tumor when preſſed, its whiteneſs and remiſſion of pain, heat, redneſs, tenſion, pulſation, and fever ; the pointed aſpect of the tumor, and a ſenſation of weight, ſucceding the pain, are alſo ſigns that the pus is ſufficiently formed, and fit for evacuation. When theſe ſigns indicate the maturity of the tumor, the knife is to be introduced into its ſofteſt, whiteſt, and moſt prominent part, till the pus flowing out, evinces that a ſufficient penertration is made : then let the knife be raiſed equally upwards, ſo as to make an inciſion ſufficiently large, or forcing its point through the oppoſite part of the abſceſs ; let the intermediate integuments be divided, taking care to avoid the nerves and large veſſels. The inciſion being made, and the pus evacuated, let the abſceſs be cured by cleanſing, ſuppurating, digeſtive, and deterſive medicines, which muſt be varied according to the ſtate of the part.

Dr. Buchan obſerves, in the laſt edition of his Domeſtic Medicine, 1797, p. 308, " If an abſceſs, or impoſthume, is formed in the liver, all methods ſhould be tried to make it break, and diſcharge itſelf outwardly ; as by fomentations, the application of poultices, ripening cataplaſms, &c. Sometimes, indeed, the matter of an abſceſs comes away in the urine, and ſometimes it is diſcharged by ſtool, but theſe are efforts of nature, which no means can promote. When the abſceſs burſts into the cavity of the abdomen at large, death muſt enſue ; nor will the event be more favourable than when the abſceſs is opened by an inciſion, unleſs in caſes where the liver adheres to the peritoneum, ſo as to form a bag for the matter, and prevent it from falling into the cavity of the abdomen ; in which caſe, opening the abſceſs by a ſufficiently large inciſion, will probably ſave the patient's life. A chirurgical profeſſor remarks, in a treatiſe on this ſubject, that he had a patient who had ſeveral abſceſſes in the liver opened, and afterwards became a ſtrong healthy man, and lived to be eighty years of age.

" If the diſorder, in ſpite of all endeavours to the contrary, ſhould end in a ſchirrus, the patient muſt be careful to regulate his diet, &c. in ſuch a manner as not to aggravate the diſeaſe. He muſt not indulge in fleſh, fiſh, ſtrong liquors, or any highly ſeaſoned or ſalted proviſions, but ſhould, for the moſt part, live on mild vegetables, as fruits and roots ; taking gentle exerciſe, and drinking whey, barley water, and butter-milk. If he takes any thing ſtronger, it ſhould be ſomething leſs heating than wine or ſpirits.

" From whatever cauſe an inflamation proceeds, it muſt terminate either by diſperſion, ſuppuration, or gangrene, Though it is impoſſible to foretell, with certainty, in which of theſe ways any particular inflammation will terminate, yet a probable conjecture may be formed, with regard to the event, from the patient's age and conſtitution. Inflammations happening in a ſlight degree upon colds, and without any previous indiſpoſition, will moſt probably be diſperſed ; theſe which follow cloſe upon a fever, or happen to perſons of a groſs habit of body, will generally ſuppurate ; and thoſe which attack very old people, or perſons of a dropſical habit, will have a ſtrong tendency to gangrene.

" If the inflammation be ſlight, and the conſtitution ſound, the diſperſion ought always to be attempted. This will beſt be promoted by a ſlender, diluting diet, plentiful bleeding, and repeated purges. The part itſelf muſt be fomented ; and if the ſkin be very tenſe, it may be embrocated with a mixture of three-fourths of ſweet oil, and one-fourth of vinegar, and afterwards covered with a piece of wax plaiſter.

" If, notwithſtanding theſe applications, the ſymptomatic fever increaſes, and the tumor becomes larger, with violent pain and pulſation, it will be proper to promote ſuppuration. The beſt application for this purpoſe is a ſoft poultice, which may be renewed twice-a-day. If the ſuppuration proceeds but ſlowly, a raw onion, cut ſmall, or bruiſed, may be ſpread upon the poultice when the abſceſs is ripe for opening, which may eaſily be known from the thickneſs of the ſkin in the moſt prominent part of it, a fluctuation of matter, which may be felt under the finger, and generally ſpeaking, an abatement of the pain, it may be opened either with a lancet, or by means of a cauſtic.

“ Theſe obſervations include the treatment of all theſe diſeaſes which, in different parts of the country, go by the names of *biles*, *impoſthumes*, *whitloes*, &c. They are all abſceſſes in conſequence of a previous inflammation, which, if poſſible, ought to be diſcuſſed; but when this cannot be done, the ſuppuration ſhould be promoted, and the matter diſcharged by an inciſion: if neceſſary, afterwards, the ſore may be dreſſed with yellow baſilicon, or ſome other digeſtive ointment.”

ABSCISSE, Abscissa, in conics, a part of the diameter, or tranſverſe axis of a conic ſection, intercepted between the vertex, or ſome other fixed point, and a ſemiordinate. In the parabola, the abſciſſe is a third proportional to the parameter and ſemiordinate; and the parameter a third proportional to the abſciſſe and ſemiordinate. In the elipſis, the ſquare of the ſemiordinate is equal to the rectangle of the parameter into the abſciſſe, ſubtracting another rectangle of the ſame abſciſſe, into a fourth proportional to the axis, parameter and abſciſſe. In the hyperbola the ſquares of the ſemiordinates are to each other as the rectangles of the abſciſſe into another line, compoſed of the abſcriſſe and the tranſverſe axis. See Conic ſections, in the ſyſtem of Geometry.

ABCISSION, from *abſciſſo*, in rethoric, a figure of ſpeech, whereby the ſpeaker ſtops ſhort in the middle of his diſcourſe; ſo that an auditor is left to form his own conſtruction, or make what inference he pleaſes; i. e. “ one of her ſex, age, and beauty, to be ſeen at ſuch an hour, in ſuch a place, with a man of his character!.... But I ſay no more.”

Abſciſſion is a ſpecies of ellipſis, or ſuppreſſion. Scaliger diſtinguiſhes it from preciſion, and ſuſpenſion.

Abscission, in ſurgery, denotes the act of taking away ſome morbid or ſuperfluous part by an edged inſtrument. In this ſenſe abſciſſion amounts to the ſame with the Greek *apokope*. Cowper ſpeaks of the abſciſſion of a leg, which is more properly called *amputation*. The abſciſſion of the præpus makes what is called circumciſion. Abſciſſion of the ears is a kind of legal puniſhment, formerly inflicted on perjury. In ſome countries they alſo practice abſciſſion of the noſe on traitors in an army, a puniſhment reputed worſe than death.

Abſciſſion is more properly uſed for the operation of cutting away ſome ſoft part of the body, when depraved or grown hurtful. In which ſenſe abſciſſion differs from amputation, in that the latter is of a ſolid or bony part, the former of a fleſhy or membranous one; yet they are ſometimes confounded. We ſay the abſciſſion of a nerve, lip, cheek, or the like. Mr. Shipton gives an inſtance of the abſciſſion of a portion of the inteſtines not being mortal Eng. Phil. Tranſ. N. 283.

ABSCONSA, a dark lantern, uſed by the monks at the ceremony of burying their dead.

ABSECON, the name of a Sandy Bank on the Jerſey ſhore, S. W. of little Egg-Harbour.

ABSINTHIUM, in botany, the trivial name of the common wormwood or artemſia. It is alſo a ſynonyme of the tanacetum incanum, the ſececio incanum, the anthemis montana, the achillæa egyptiaca, and of the parthenium hyſterophorus. See Artemisia, &c. and Materia Medica.

ABSIS, in aſtronomy, the ſame with Apsis.

ABSOLUTE, in a general ſenſe, ſomething that ſtands free or independent. In metaphyſics it denotes a being whoſe whole eſſence does not conſiſt in a mere habitude or relation to another. In which ſenſe abſolute ſtands oppoſed to relative or reſpective. Abſolute is more particularly underſtood of a thing which does not proceed from any cauſe, or does not ſubſiſt by virtue of any other being, conſidered as its cauſe. In which ſenſe God alone is abſolute. Abſolute in this ſenſe is ſynonymous with independent, and ſtands oppoſed to dependent. Abſolute alſo denotes a thing's being free from conditions or limitations. In this ſenſe the word is ſynonymous with unconditional. We ſay, an abſolute decree, abſolute promiſe, abſolute obedience. The covenant with Noah was abſolute, and without conditions; that under the goſpel, on condition of faith and obedience.

Absolute *Number*, in algebra, is the known quantity or number which poſſeſſes one entire ſide, or part of an equation: being the rectangle or ſolid, whoſe root or value is to be found. Thus, in the equation $aa+16a=36$, the abſolute number is 36; which is equal to a multiplied by itſelf, and added to 16 times a.

Absolute *Gravity*, in phyſics; is the whole force by which a body is urged downwards.

Absolute *Government*, is that wherein the prince, unlimited by the laws, is left ſolely to his own will.

Absolute *Equation*, in aſtronomy, is the aggregate of the optic and eccentric equations. The apparent inequality of a planet's motion ariſig from its not being equally diſtant from the earth at all times, is called its optic equation, and would ſubſiſt even if the planet's real motion were uniform. The eccentric inequality is cauſed by the planet's motion being uniform. To illuſtrate which, conceive the ſun to move, or to appear to move, in the circumference of a circle, in whoſe centre the earth is placed. It is manifeſt, that if the ſun moves uniformly in this circle, it muſt appear to move uniformly to a ſpectator on the earth, and in this caſe there will be no optic nor eccentric equation: but ſuppoſe the earth to be placed out of the centre of the circle, and then, though the ſun's motion ſhould be really uniform, it would not appear to be ſo, being ſeen from the earth: and in this caſe there would be an optic equation, without an eccentric one. Imagine farther, the ſun's orbit to be not circular, but elliptic, and the earth in its focus: it will be as evident that the ſun cannot appear to have an uniform motion in ſuch ellipſe; ſo that his motion will then be ſubject to two equations, the optic and the eccentric. See Equation.

Absolute *Motion*	See	Motion.
Absolute *Space*		Space.
Absolute *Time*		Time.

Absolute, in metaphyſics, denotes a being that poſſeſſes independent exiſtence.

ABSOLUTION, in general, is the pardoning or forgiving a guilty perſon.

Absolution, in civil law, is a ſentence whereby the party accuſed is declared innocent of the crime laid to his charge.

Absolution, in the canon law, is a juridical act, whereby the prieſt declares the ſins of ſuch as are penitent remitted.

Absolution is chiefly uſed among Proteſtants for a ſentence whereby a perſon who ſtands excommunicated is releaſed or freed from that puniſhment.

ABSORBENTS, in a general ſenſe, is uſed for ſuch things as have the faculty of abſorbing, or ſwallowing up others. Aſhes are an abſorbent in reſpect of water, though not in the degree ſuppoſed by Ariſtotle, from whom we derive a vulgar error, that a pot full of aſhes will ſtill abſorb as much water as if empty. Cloves are ſo violent an abſorbent of moiſture, that we are told, if care be not taken in the importing, to keep all water, wine and the like at a good diſtance from them, they will drain a conſiderable quantity of wine from a caſk.

Mr. Homberg has a diſcourſe on the quantity of acids abſorbed by terreſtrial alkalies, wherein he ſhews how much acid any known alkali will retain. De la Hire gives an experiment for aſcertaining the quantity of water abſorbed by plants. Mem. Acad. Scienc. an. 1700, p. 81.

Absorbents, in medicine, remedies which, by the ſoftneſs or poroſity of their component parts, become proper to ſheathe the aſperities of ſharp pungent humours: or to imbibe, or dry away, as with a ſponge, ſuperfluous moiſtures: and are of divers kinds, ſimple, compound, ſaline, cinnabarine, marine, fixed, earthy, acid, alkaline, &c. In the Pharmacopœias we meet with ſeveral forms of abſorbents, ſuch as the teſtaceous powders, hartſhorn, coral, crab's-eyes and claws, calcined bones, burnt ivory, terra ſigillata, and even iron itſelf; alſo divers woods; as ſanders, maſtic, guaiacum, ſaſſafras; and divers roots; as ſarſaparilla, &c.

Abſorbents, ſays Juncker, conſume the humours without fuſing them, and have ſometimes the effect of ſtrengtheners, ſometimes of purgatives, but oftener of calmers, to allay fermentations. They are of uſe for tempering acrimonies; and, after emollients and attenuants, for healing tumours. Some hold them neceſſary for preventing the ill effects of bitters. They are good in cardialgias, or heats of the ſtomach, or hiccups. They are alſo given in hectics, and other chronical caſes, as coughs, though with great caution and reſerve. Abſorbents have alſo their ill effects, eſpecially if too laviſhly given, being liable to many congeſtions in the viſcera. They are hurtful in the itch, bilious fevers, dyſenteries, hypocondriacal and hyſteric caſes, quartans, &c. They are generally preſcribed as the only remedy for the acute diſeaſes, though held by others rather hurtful to children, by loading their tender viſcera, and creating obſtructions in the capillaries. Particular kinds of abſorbents have their particular effects; old oyſter-ſhells are preferred for children: magiſteries and precipitates are leaſt ſuitable, as being already ſurcharged with acids. Abſorbents ſaturated with acid juices, as of citrons, are good in coughs and catarrhs; prepared with cinnabar, in iſchurias; with aſtringents, in the diabetes; ſaline, in the itch; marine, in chronical diſeaſes of the breaſt; in which laſt caſe the earthy are hurtful. They are ſometimes applied to ulcers: but it is to be obſerved, that the inſipid terreſtreous abſorbents, ſuch as coral, &c. put into an ulcer, where the bone is carious, can have little other effect than to imbibe the matter of the ulcer: if they fall into any cavernulæ of the corrupted bone, they may remain ſo long there, that the matter they imbibe may become acrid. Lint is an abſorbent which has not this diſadvantage. Monro, in Med. Eſſ. Edinb. vol. v. art. 24.

The taking of an immoderate quantity of crab's eyes, and other abſorbents, for the heart-burn, has ſometimes been attended with fatal conſequences. Eng. Phil. Tranſ. No. 459, Sect. II.

Van Sweiten, in his Comment on Boerhaave's Aphoriſms, obſerves, that theſe abſorbent powders ought not to be ground too fine, but rather left ſomewhat coarſe, as they will be leſs apt to concrete, and prove dangerous. It is a neceſſary caution to drink diluting liquors with them; alſo to take gentle purges, as well for ſome time after they are left off, as during the uſe of them. Abſorbents are much the ſame with what we otherwiſe call driers and ſweetners. Latin writers alſo uſe the word as ſynonymous with *imbibentia* and *ſaturantia*. The term abſorbent is frequently confounded with alkali; alkalies having really the effect of abſorbents, with reſpect to acids.

Absorbent *Veſſels*, a minute kind of veſſels found in animal bodies, which attract and imbibe the nutritious and other matters brought near their mouths. Theſe are ſometimes called reſorbent veſſels, and ſometimes abſorbent pores. Abſorbent veſſels are found in all parts of the body, eſpecially where the membranes lie open to cavities, as in the mouth, œſophagus, ſtomach, inteſtines, &c. A late author computes no leſs than 7,000,000,000 in one ſquare foot of the ſurface of the ſtomach. By theſe, mercury, plaiſters, and the like medicines externally applied, enter the habit of the body. To theſe are alſo owing the inſtantaneous effects of ſpirits, drams, water, &c. upon the body. The like veſſels are alſo numerous in the ſkin, where they are ſuppoſed to imbibe the fluid matter floating in the ambient air, and convey them into the body. Mortimer. Exerg. Inaug. de Ingreſ. Humor. in Corp.

It has been ſaid that there are no abſorbent veins, and that abſorption is performed entirely by the valvular lymphatics. But if this were the caſe, we ſhould be continually ſubject to a hydrocephalus; becauſe in the head no valvular lymphatics are found.

It is plain that there are abſorbent veins that open into the cavities of the body, becauſe in the aſcites the extravaſated water is frequently received into the circulation, and diſcharged by urine or ſtool. Dr. Hunter aſcertains it by the following experiment on a living dog; an opening was made in the cavity of his belly, and three quarts of warm water injected and ſecured: ſix hours after he was examined, and not above four ounces of the water remained. For further ſatiſfaction on this ſubject, conſult Hunter's Commentaries, and Dr. Garney's Obſervations on them, in the Eng. Medic. Muſ. vol. ii. p. 229; and alſo Dr. Wilkinſon, ib. p. 117, &c.

Abſorbent veſſels are more particularly uſed for thoſe lacteals which open into the ſides of the inteſtinal tube, to imbibe the chyle in its deſcent from the ſtomach, and convey it into the meſenteric veins. Naturaliſts, as Malpighi, Leewenhoeck, De la Hire, &c. ſpeak of the like abſorbents in plants, the fibrous or hairy roots of which are conſidered as a kind of *vasa absorbentia*, which attract and imbibe the nutritious juices from the earth. For a copious account of theſe veſſels, ſee ANATOMY. See alſo the article of LYMPHATICS.

ABSORBING, the act of ſucking up, or imbibing another body, Sir Iſaac Newton ſhews that black bodies abſorb all the rays they receive, and that thoſe rays of light, which impinge againſt the ſolid particles of bodies, are abſorbed and loſt: but it appears from ſome later experiments and obſervations of Mr. Bouguer, that this effect is to be attributed, not to the impact of light on the ſolid parts of bodies, but to the action of ſome power diffuſed over their ſurfaces. He found, by repeated trials on the reflection of light, from the ſurface of water, and of different pieces of cryſtal, that a conſiderable quantity of light, when the angles of incidence were ſmall, was actually extinguiſhed. This effect, he obſerved, was diminiſhed by encreaſing the incidence; ſo that an inclination to chryſtal of above 49° 49′ a very ſmall part of the rays was abſorbed; though ſome few were loſt, when they fell perpendicularly on the reflecting ſurface. See his Traite d'Optique, Paris, 1760.

ABSORPTION, in the animal economy, is uſed for that power whereby the ſmall open orifices of veſſels imbibe liquors lodged in the cavities of animal bodies. This, according to Dr. Monro, is obſerved to increaſe or diminiſh proportionably to the ſtrength or weakneſs of the creature. Med. Eſſ. Edinb. vol. iii. p. 132.

Fluids applied to the ſurface of the body are alſo abſorbed through the minute pores of the ſkin, and the mouths of a ſet of veſſels appropriated for this action; which, beſide the property of capillary tubes, poſſeſs alſo a contractile power from irritation.

ABSORPTION *of the earth*, a term uſed by Kircher and others, for the ſinking in of large tracts of land, by means of ſubterranean commotions, and many other accidents. Pliny tells us, that in his time the mountain Cymbotus, with the town of Eurites, which ſtood on its ſide, were wholly abſorbed into the earth, ſo that not the leaſt trace of either remained; and he records the like fate of the city Tantalis, in Magneſia; and after it of the mountain of Syperus, both thus abſorbed by a violent opening of the earth. Galanis and Garnatus, towns once famous in Phœnicia, are recorded to have ſhared the ſame fate; and the vaſt promontory, called Phlegium, in Æthiopia, after a violent earthquake in the night-time, was not to be ſeen in the morning, the whole having diſappeared, and the earth cloſed over it. Theſe and many other hiſtories, atteſted by the authors of greateſt credit among the ancients, abundantly prove the fact in the earlier ages; and there have not been wanting too many inſtances of modern date. Kircher's Mund. Subter. p. 77. See EARTH and EARTHQUAKES.

The mountain Picus, in one of the Molucca iſles, was ſo lofty, that it appeared at a great diſtance as an immenſe column reared erect in the air, and ſerved as a land-mark to ſailors; an earthquake, in this iſland deſtroyed it; at one inſtant the whole mountain was abſorbed into the bowels of the earth, and no mark of its place remained, but a vaſt lake of water, exactly anſwering to the ſhape of the baſe of the mountain. A like accident, but of a more terrible kind, happened in China, in the year 1556, when a whole province of the mountainous parts of the kingdom was in one moment abſorbed into the earth, and all the towns buried, the whole number of the inhabitants ſinking with it, and an immenſe lake of water remaining in its place to this time. Of much later date is the deſtruction of a city in the confines of Swiſſerland: but this, though generally ſaid to have been ſwallowed up into the earth, was not properly an abſorption, for the whole city was buried by the fall of a mountain upon it.

The burning mountains Veſuvius and Stongylus, both once very high, have, in length of time, loſt half their height, the upper part having been undermined by the burning, and have fallen into, and been abſorbed by, the under part. And in the year 1546, during the terrible earthquake in the country of Chili, ſeveral whole mountains in the Andes diſappeared, and were one after another wholly abſorbed in the earth. Theſe, and a thouſand other accidents of the like kind, prove the truth of abſorptions in general; ſome of them leaving level ground in the place of the things abſorbed, ſome immenſe chaſms and cracks, and ſome lakes of freſh or ſalt water; and it may be that many immenſe lakes were formed, in ages of which we have no hiſtories, by the like abſorptions.

There are inſtances of iſlands being produced, though we cannot affirm them to have appeared in the place of any which have been abſorbed. In the year 1638, an iſland was raiſed near St. Michael's in the Atlantic Ocean, by ſubterranean fires, which threw up ſtones and other ſubterranean productions in ſuch quantities, that they formed an iſland of five miles in length. The mountain raiſed, in one night, in the ſea near Puzzoli, is another inſtance of this ſudden production of theſe mountains: this appeared after one night's violent ſubterranean conflict, and ſtill keeps its place, and is known by the name of Mons Sanctus. There exiſts a tradition that a large tract of elevated mountains in Canada, at a remote period, were abſorbed by the earth, and that the ſcite of the mountains now preſents one of the immenſe lakes of that part of our continent.

ABSTEMIOUS, is properly underſtood of a perſon who refrains abſolutely from all uſe of wine. It is compounded of *abs*, from, and *timetum*, wine. The hiſtory of Mr. Wood, in the Eng. Medic. Tranſ. vol. ii. p. 261, is a very remarkable exemplification of the very beneficial alterations which may be effected on the human body by a ſtrict courſe of abſtemiouſneſs. The Roman ladies, in the firſt ages of the republic, were all enjoined to be abſtemious; and that it might appear, by their breath, whether or no they kept up to the injunction, it was one of the laws of the Roman civility, that they ſhould kiſs their friends and relations whenever they accoſted them.

ABSTERGENTS, or ABSTERSIVE MEDICINES, more uſually called, among phyſicians, detergents, are cleanſing medicines of a ſaponaceous nature, capable of diſſolving concretions, formed of earth and oil, which water ſimply, as an abluent, cannot effect.

ABSTINENCE, in a general ſenſe, implis the act or habit of refraining from ſomething which we have a propenſity to, or find a pleaſure in. The word is derived from *abstinere*, formed of *abs*, from, and *tenere*, to hold.

The Jewiſh law ordained that the prieſts ſhould abſtain from the uſe of wine, during all the time of their being employed in the ſervice of the temple. The ſame abſtinence was enjoined the Nazarites, during the time of their Nazariteſhip, or ſeparation. The Jews were commanded to abſtain from ſeveral ſorts of animals, viz. all ſuch as have not the hoof parted, and do not chew the cud. The fat of all ſorts of animals, that were ſacrificed, was forbidden to be eaten; and the blood of every animal in general was prohibited under pain of death. Neither did they eat the ſinew, which is upon the hollow of the thigh, though deemed to be otherwiſe pure, becauſe the angel, who wreſtled with Jacob at Mahanaim, touched the hollow of his thigh, which occaſioned the ſinew to ſhrink. They abſtained likewiſe from thoſe animals which had been taken by a devouring and impure beaſt, ſuch as a dog, a wolf, a boar, &c. and from ſuch as died of themſelves. Fiſh that had neither fins nor ſcales were to be abſtained from as impure. Some are of opinion that this diſtinction of animals, into clean and unclean, was intended to denote the moral purity or impurity which the Hebrews were to endeavour after, or avoid. A hog, for inſtance, ſignifies gluttony; a hare, laſciviouſneſs; and ſo others. Again, a ſheep denotes gentleneſs; a pidgeon, ſimplicity; and the like. But many commentators are of opinion, that ſeveral animals were declared unclean, and therefore to be abſtained from, only becauſe of ſome qualities in them naturally hurtful and pernicious to health.

Among the primitive Chriſtians, ſome denied themſelves the uſe of ſuch meats as were prohibited by the law: others looked upon this abſtinence with contempt. St. Paul has given his opinion in this matter: "One believeth that he may eat all things; another, who is weak, eateth herbs. Let not him that eateth deſpiſe him that eateth not. And let not him that eateth not judge him that eateth." Rom. xiv. 1, 2, 3; and 1 Cor. viii. 7 and 10. The council of Jeruſalem, which was held by the apoſtles, enjoined the Chriſtian converts to abſtain from meats ſtrangled, from blood, from fornication, and from idolatry. Abſtinence, as preſcribed by the goſpel, is intended to mortify and reſtrain the paſſions, to humble our vicious natures, and by that means raiſe our minds to a due ſenſe of prayer and devotion. But there is another ſort of abſtinence, which may be called ritual, and conſiſts in abſtaining from particular meats at certain times and ſeaſons.

The Jews are obliged to abſtain from their wives at certain ſeaſons. The ſame is enjoined in the apoſtolical conſtitutions, on all faſts and meagre days. The church of England recommends certain days of faſting and abſtinence. Abſtinence from fleſh was enjoined by Engliſh ſtatutes ſince the reformation, particularly on Fridays and Saturdays, and on the vigils, and all commonly called fiſh-days; 2 and 3 Edw. VI. cap. 19. The like injunctions were renewed under Elizabeth; but at the ſame time it was declared, that this was done not out of motives of religion, as if there were any difference in meats, but in favour of the conſumption of ſea fiſh, and to multiply the number of fiſhermen and mariners, as well as to ſpare the flocks of ſheep; 5 Eiz. cap. 15. "The great faſt (ſays St. Auguſtin) is to abſtain from ſin."

Several writers are of opinion, that, before the flood, mankind abſtained from wine and fleſh; becauſe the ſcriptures expreſsly mention that Noah, immediately after the deluge, began to plant the vine, and that God permitted him to make uſe of animal food; whereas he had given to Adam nothing more than the fruits and plants of the earth. This opinion, however, is not univerſal; many learned interpreters maintain the contrary, and believe that mankind, before the deluge, did not deny themſelves the pleaſures of either wine or animal food.

The Phœnicians and Aſſyrians, who were neighbours to the Jews, had their ſacred feaſts. The Egyptians, according to Herodotus, ſacrificed a cow to Iſis, after they had prepared themſelves to faſting. He alſo attributes the ſame cuſtom to the women of Cyrene. Among the Athenians, the Eleuſinian feaſts, as well as the Thermophores, were attended with rigorous faſtings, eſpecially among the women, who paſſed a whole day ſitting on the ground, in a mourning habit, and without taking the leaſt ſuſtenance. The Romans had alſo ſettled faſts in honour of Jupiter. Hiſtorians alſo mention thoſe of Julius Cæſar, Auguſtus, Veſpaſian, Marcus Aurelius, &c. The Pythagoreans, (at leaſt thoſe among them who profeſſed the greateſt perfection, and gloried in having attained to the higheſt degree of their maſter's theory) never eat either fleſh or fiſh; their abſtaining from whatever had life was a conſequence of the metempſychoſis; though it is not eaſy to diſcover the cauſe from whence Pythagoras imbibed that averſion he always had to beans, mallows, wine, &c. He might, indeed, abſtain from eggs, becauſe chickens were produced from them; but upon what foundation could he build his argument, that the bean was a ſacred plant? He held, that the Gods patronized the mallow plant. And probably he imbibed theſe notions along with his doctrines of the metempſychoſis in the Eaſt. The Bramins at this day, (1801) abſtain from various vegetable productions, which are univerſally allowed to be wholeſome and nutritive; as the *turnip* and *onion*; the former particularly, under the name of *ſaalgram*, enjoys a portion of adoration.

In the brute creation we ſee extraordinary inſtances of long abſtinence, many of the ſpecies paſs four, five, or ſix months, every year, without either food or water. The ſerpent, land-tortoiſe, dormouſe, &c. are obſerved to retire regularly, at certain ſeaſons, to their reſpective cells, and conceal themſelves from ſight; ſome hide themſelves in the caverns of rocks, or ruins; ſome dig holes in the earth; while others retire to the woods, and lay themſelves up in the clefts of trees. Several ſpecies of birds, and almoſt the whole tribe of inſects, are capable of ſubſiſting the whole winter, not only without food, but even without reſpiration. This particular furniſhes us with an admirable inſtance of the wiſdom of the Creator: the proper food of theſe creatures, particularly thoſe of the inſect tribe, being then wanting, proviſion is made for them to live without it. When the fields are diveſted of their flowery furniture, and the trees and plants are ſtripped of their fruits, what would become of creatures ſubſiſting only by the produce of ſpring and ſummer? And when the air is grown rigid, and chilled with froſt, what could ſupport theſe tender ſpecies which are impatient of cold? Therefore, to prevent the total deſtruction and extirpation of ſo many ſpecies of animals, the author of nature has wiſely provided, that creatures thus bereaved of their food, ſhould be alſo impatient of cold, in order to lead them to ſome receſs, where they may find ſhelter from danger; while the natural texture and viſcidity of their blood, diſpoſes it by a further degree of cold, to become almoſt ſtagnant in their veſſels; ſo that the circulation being hardly carried on, and the animal function in a great meaſure ſuſpended, there is no ſenſible waſte or conſumption of parts, but they remain in a drowſy neutral ſtate, between life and death, till the warm ſun at once recalls them to life, and produces the food neceſſary to their exiſtence, by thawing the congealed juices both of theſe animals and vegetables. Hence it is no wonder that the land tortoiſes, dormice, &c. are found as fat and fleſhy after ſome months abſtinence as before. In the Engliſh Phil. Tranſ. No. 104, we learn, that a tortoiſe was weighed ſeveral years at its going into the earth in October, and at its coming out again in March, and found that of 4 lb. 4 oz. it never loſt more than an ounce.

It is to be added, that, in moſt inſtances of extraordinary human abſtinence, related by naturaliſts, there were ſaid to have been apparent marks of a texture of blood and humours, much like that of the animals abovementioned; though it is no improbable opinion that the air itſelf may furniſh ſomething for nutrition. It is certain there are ſubſtances of all kinds, animals, vegetables, &c. floating in the atmoſphere, which muſt be continually taken in by reſpiration; and that an animel body may be nouriſhed thereby, is evident in the inſtance of vipers; which, if taken when firſt brought forth, and kept from every thing but air, will grow very conſiderably in a few days. So the eggs of lizards are obſerved to encreaſe in bulk, after they are produced, though there be nothing to furniſh the increment but air alone; in the like manner, as the eggs and ſpawn of the fiſhes grow and are nouriſhed with the water.

Abstinence in phyſic, is a term of a very extenſive ſignification, for it implies a privation of all ſucculent aliments. Though abſtinence is not ſufficient for the cure of diſeaſes, yet it greatly aſſiſts the operation of medicines, and is a preventive againſt a multitude of dangerous diſorders. Several writers relate extraordinary cures performed by it, and in protracting the term of human life. The noble Venetian Conaro, after every method had been tried in vain, and his life was deſpaired of when he was no more than forty years of age, recovered his former health, and lived to near an hundred years old, by the ſole effect of abſtinence, as he himſelf tells us in a book he publiſhed on that ſubject. It is, indeed, ſurpriſing to what a great age the primative chriſtians of the eaſt, who retired from perſecution into the deſerts of Arabia and Egypt, lived healthful and cheerful, on very little food. Caſſian aſſures us that the common allowance for twenty-four hours, was only twelve ounces of bread, and mere water. He adds, that with this ſparing diet, St. Anthony lived an hundred and five years; James, the hermit, one hundred and four; Arſenius, tutor to the emperor Arcadius, an hundred and twenty; St. Epiphanes, an hundred and fifteen; Simeon the Stylite, an hundred and twelve; and Romauld an hundred and twenty. Nor need we have recourſe to the eaſtern Chriſtians for examples, ſince modern hiſtory furniſhes us with ſome even ſuperior to thoſe already recited. Buchan relates, that one Laurence preſerved his life to an hundred and forty years by temperance and labour; and Spotſwood mentions one Kentigem, afterwards called St. Monga, or Mungo, who lived to the age of an hundred and ſeventy-five, by the ſame means.

Dr. Cheyne imputes moſt of ths chronical diſeaſes, the infirmities of old age, and the ſhort lives of Engliſhmen to repletion; and that they may be either prevented or cured by abſtinence. The Hindus alſo, when they feel any ſymptoms of illneſs, immediately abſtain from food for an unuſual length of time. When their motives, are enquired into for this abſtinence, they reply, that they wiſh *to ſtarve away diſeaſe*. For further inſtances of the effects of abſtinence, ſee Longevity, &c.

ABSTINENTS, or Abstinentes, a ſet of heretics that appeared in France or Spain about the end of the third century. They are ſuppoſed to have borrowed part of their opinions from the Gnoſtics and Manicheans, becauſe they oppoſed marriage, condemned the uſe of meats, and placed the Holy Ghoſt in the claſs of created beings.

ABSTRACT, *Abſtractum*, in a general ſenſe, any thing ſeparathd from ſomething elſe, which is of like parts, powers, or principles.

Abstract *idea*, in metaphyſics, is a partial idea of a complex object, limited to one or more component parts, or properties; laying aſide, or abſtracting from the reſt. Thus in viewing an object with the eye, or recollecting it in the mind, we can eaſily abſtract from ſome of its parts or properties, and attach ourſelves to others; e. g. we can attend to beautiful hues of fruits or flowers, without paying any regard to their figure, ſhape, taſte, ſmell or conſiſtence.

Absract *terms*, in logic, are ſuch as denote thoſe objects which exiſt in imagination only. Thus beauty and uglineſs are abſtract terms. There are ſome objects that pleaſe and eppear beautiful; others affect us in a very different manner; which we call ugly; and yet there are no ſuch real ſubſtances in nature, as beauty or uglineſs: they ſubſiſt only in our imagination.

Abstact *numbers* are aſſemblages of units conſidered in themſelves, and not applied to denote any collections of particular ſorts of things.

Abstract *mathematics*, otherwiſe called *pure mathematics*, are thoſe branches which treat of magnitude or quantity, conſidered abſolutely, without any reſtriction to a particular part. Thus geometry, algebra, and arithmetic, are abſtract mathematics. In this ſenſe, abſtract mathematics ſtand oppoſed to mixed mathematics, wherein ſimple and abſtract properties, and the relations of quantities, primitively conſidered in pure mathematics, are applied to ſenſible objects, and by that means become intermixed with phyſical conſiderations; ſuch are, *navigation*, *hydroſtatics*, *optics*, &c.

Absract, in literature, denotes a ſelection of the beauties, or particular and more ſtriking paſſages, of an author, without any abridgement of the paſſages ſo ſelected; as is *The Flowers of Literature*, which contain abſtracts from Pope, Swift, Watts, Sterne, &c. &c.

ABSTRACTION, in general, the art of abſtracting, or the ſtate of being abſtracted.

Abstraction, in metaphyſics, the operation of the mind, when occupied by abſtract ideas. A large oak fixes our attention, and abſtracts us from the ſhrubs that ſurround it. In the ſame manner a beautiful woman, in a crowd, abſtracts our thoughts, and engroſſes our attention ſolely to herſelf. Theſe are examples of real abſtraction; when theſe, or any others of a ſimilar kind, are recalled to the mind, after the objects themſelves are removed from our ſight, they form what is called *abſtract ideas;* or the mind is ſaid to be employed in abſtract ideas. But the power of abſtraction is not confined to objects that are ſeparable in reality as well as mentally; the ſize, the figure, the colour of a tree are inſeparably connected, and cannot exiſt independent of each other; and yet we can mentally confine our obſervations to any one of theſe properties, neglecting, or abſtracting from the reſt.

Abſtraction is chiefly employed theſe three ways. Firſt, when the mind conſiders any one part of a thing in ſome reſpect diſtinct from the whole; as a man's arm, without the conſideration of the reſt of the body. Secondly, when we conſider the *mode* of any ſubſtance, omitting the ſubſtance itſelf; or when we ſeparately conſider ſeveral modes which ſubſiſt together in one ſubject. This abſtraction the geometricians make uſe of when they conſider the length of a body ſeparately, which they call *a line*, omitting the conſideration of its breadth and thickneſs. Thirdly, it is by abſtraction that the mind forms general or univerſal ideas, omitting the modes and relations of the particular objects whence they are formed. Thus, when we would underſtand a thinking being in general, we gather from our own ſelf-conſciouſneſs what it is to think; and omitting thoſe things which have a particular relation to our own minds, or to the human mind, we conceive a thinking being in general. Ideas formed in this manner, which are what we properly call *abſtract ideas*, become general repreſentatives of all objects of the ſame kind, and their names applicable to whatever exiſts conformable to ſuch ideas. Thus, the idea of colour, that we receive from chalk, ſnow, milk, &c. is a repreſentative of all of that kind, and has a name given it, *whiteness*, which ſignifies the ſame quality wherever found or imagined.

The late lord Bolingbroke controverted the exiſtence of abſtract ideas; and Mr. Hume, in his eſſays, aſſerts, that it is unintelligible and abſurd to conclude, that the ideas of primary qualities are obtained by abſtraction; and he has purſued Berkeley's reaſoning to an extent, which he himſelf never intended, and repreſented all his arguments as merely ſceptical, "becauſe they admit of no anſwer, and produce no conviction." He concurs with Dr. Berkeley in denying the exiſtence of matter; and advances a ſtep farther, maintaining that the ſoul is merely a bundle of perceptions, that there is nothing in the univerſe but impreſſions and ideas.

Some late Scotch writers (doctors Reid, Beattie and Oſwald,) with a view of obviating thoſe ſceptical inferences, which had been deduced from the principles of Mr. Locke, have, in oppoſition to theſe, offered a new ſyſtem reſpecting the nature and origin of our ideas. See Zoonomia, vol. I. Sect. 14, 15.

We ſhall only add, that abſtracting, on the common ſyſtem, is no more than generalizing; it is making one thing ſtand for an hundred, by omitting the conſideration of the differences between them: it is taking ſeveral differents, i. e. different combinations, ſetting aſide the peculiarities in each, and conſidering only what is found alike in all. Thus it is that I ſay, I love my friend, love my miſtreſs, love myſelf, my bottle, my book, my eaſe, &c. Not that it is poſſible I ſhould have the ſame perception with reſpect to ſo many different ſorts of things, things that ſtand in ſuch different relations to me; but only that, there appearing ſomething in them all that bears a reſemblance to the reſt, in ſome circumſtance or other, I chooſe to expreſs all by one name, *love*. For if I conſider the tendency and effects of them all, I ſhall find they lead me very different ways, or to very different actions. All the analogy there is between them, is a ſort of pleaſure or ſatisfaction, ariſing upon the application of the particular object of its proper organ or ſenſe. The abſtract idea of love, then, will terminate in the idea of pleaſure; but it is certain there can be no idea of pleaſure without a thing pleaſant to excite it. Any other abſtract idea of pleaſure will amount to no more than a view or perception of the circumſtances wherewith our pleaſures have been attended: but theſe are mere externals, foreign to the pleaſurable ſenſation itſelf, which nothing but an object applied in ſuch and ſuch a manner can excite. To ſuppoſe an idea of pleaſure produced indirectly, by any other than by the proper cauſe, is as abſurd as to ſuppoſe an idea of ſound, produced without a ſonorous object. The mind has no power of making any ideas, call them what you will, whether *abſtract* or *concrete*, or *general*, or *particular;* its activity goes no farther than to the perceiving of ſuch as are preſented to it; ſo that its action is really no other than a degree of paſſion.

Dr. Price, in his Review of the principal queſtions and difficulties in Morals, p. 43; Dr. Cudworth, in his external and immutable Morality, book 4; Dr. Campbell, in his Philoſophy of Rhetoric, vol. ii, p. 105; as well as Mr. Locke and Dr. Berkeley, have ſeverally given very accurate deſcriptions of Abſtraction, both generally and particularly.

ABSTRACTITIOUS, or Abstractive, is applied by ſome modern chemiſts to a ſpirit drawn from vegetables without fermentation. In which ſenſe abſtractitious ſpirits are ſynonymous with natural ſpirits, and ſtand oppoſed to fermentative or artificial ones. Such ſpirits are chiefly procured from plants which abound in volatile ſalt. The abſtractitious ſpirits of ſcurvy-graſs is preferred to that procured by fermentation. All the native ſpirits of aromatic plants are called abſtractitious.

ABSTRUSE, ſomething deep, hidden, concealed, or far removed from common apprehenſion, and therefore not eaſily underſtood; in oppoſition to what is obvious and palpable. Thus metaphyſics is an abſtruſe ſcience; and the doctrine of fluxions, and the method *de maximis et minimis* —of the greateſt and the leaſt—are abſtruſe points of knowledge.

ABSURD, *Abſurdum*, a term applied to any action or ſentiment that contradicts or runs counter to ſome evident truth. Thus a propoſition would be abſurd, that ſhould affirm that two and two make five; or that ſhould deny them to make four. The logicians and mathematicians have a way of proving the truth of a propoſition, by ſhewing that the contrary is abſurd. This they call *reductio ad abſurdum* or arguing *ex abſurdo*. Euclid, in his Elements of Geometry; Sir Iſaac Newton, in his Theory of the Solar Syſtem; and Dr. Watts, in his Logic, have had recourſe to this method of reaſoning.

Absurd, when applied to action, is ſynonymous with ridiculous.

ABSURDITY, a kind of error or offence againſt ſome evident or generally allowed truth or principle. The ſchoolmen make two ſpecies of *abſurdities;* the one abſolute, which contradicts the common ſenſe of mankind; the other *relative*, which gives the lie to ſome one, or more philoſophers, or perſons of great weight and authority.—In this ſenſe the doctrine of a *vacuum* is an abſurdity as being contrary to Ariſtotle; and that of a *plenum*, as being contrary to Sir Iſaac Newton. In effect, there is ſcarce one truth of any moment, that is not an abſurdity in this ſenſe, as being repugnant to the ſyſtem of ſome ſect or party. As reaſon conſiſts in the due uſe of names and words, abſurdity conſiſts in the abuſe of them.

ABSYNTHIUM, or ABSINTHIUM, a medicinal plant, of conſiderable efficacy, in the quality of a bitter and ſtomachic; commonly called wormwood.

ABUNDANT *Number*, in arithmetic, is a number, the ſum of whoſe aliquot parts is greater than the number itſelf. Thus the aliquot parts of 12, being 1, 2, 3, 4, and 6, they make, when added together, 16. An abundant number is oppoſed to a deficient number, or that which is greater than all its aliquot parts taken together; as 14, whoſe aliquot parts are 1, 2, and 7, which make no more than ten; and to a perfect number, or one, to which its aliquot parts are equal, as 6, whoſe aliquot parts are 1, 2, and 3.

ABUNDANTIA, a heathen divinity, repreſented in ancient monuments under the figure of a woman with a pleaſing aſpect, crowned with garlands of flowers, pouring all ſorts of fruit out of a horn which ſhe holds in her right hand, and ſcattering grain with her left, taking promiſcuouſly from a ſheaf of corn. On a medal of Trajan, ſhe is repreſented with two cornucopiæ.

ABUSE, an irregular uſe of a thing, or the introducing of ſomething contrary to the true intention thereof. The word is compounded of *ab*, from, and *uſus*, uſe. In grammar, to apply a word abuſively, or in an abuſive ſenſe, is to miſapply, or pervert its meaning. Words being the medium through which perſons communicate their diſcoveries, reaſonings, and knowledge to each other, he who uſes them improperly, though he does not corrupt the fountain of knowledge, commits an abuſe in language, and may therefore be conſidered as an enemy to the improvement of learning.

ABUTTALS, ABBUTALS, ABUTALS, among law-writers, denote the buttings or boundings of a piece of land; expreſſing on what other lands, highways, or the like, the ſeveral extremes thereof do abut, or terminate. In this ſenſe the word is ſometimes alſo written corruptly abuttals, or abutals. In old ſurveys, they are often called *beadlands*. Abuttals amount to the ſame with what Latin writers call *capita*: Marculfus, *frontes;* the French, *bouts*. In Coke, the plaintiff is ſaid to fail in his abutals; that is, in ſetting forth how the land is bounded.

ABYLA, (Ptolemy, Mela;) one of Hercules's pillars, on the African ſide, called by the Spaniards *Sierra de las Monas*, over againſt Calpe in Spain, the other pillar; ſuppoſed to have been formerly joined, but ſeparated by Hercules and, thus to have given entrance to the ſea now called the *Mediterranean*: the limits of the labours of Hercules, (Pliny.)

ABYSS, in a general ſenſe, denotes ſomething profound, and, as it were, bottomleſs. The word is originally Greek, *abuſſos;* compounded of the primitive *a*, and *buſſos bottom*, q. d. *without a bottom*. We ſay, the abyſs of a mountain, an abyſs of waters, the great abyſs, the Moſaic abyſs, an unfathomable abyſs, &c.

ABYSS, in a more particular ſenſe, denotes a deep maſs or fund of waters. In this ſenſe the word is particularly uſed in the Septuagint, for the water which God created at the beginning with the earth, which encompaſſed it round, and which the Engliſh tranſlators rendered by the *deep*. Thus it is that darkneſs is ſaid to have been on the face of the *abyss*.

ABYSS is alſo uſed for an immenſe cavern in the earth, where God collected all thoſe waters on the third day, which in the ſame verſion, is rendered the *deep*, and elſewhere the *great deep*.

Dr. Woodward has made ſeveral obſervations and conjectures with reference to this great abyſs, in his Natural Hiſtory of the Earth. He aſſerts, that there is a vaſt collection of waters encloſed in the bowels of the earth, conſtituting a huge orb in the interior or central parts of it; and over the ſurface of this water he ſuppoſes the terreſtial ſtrata to be expanded. This, according to him, is what Moſes calls the *great deep*, and what moſt authors render the *great abyſs*. That there is ſuch an aſſemblage of waters lodged in the depths of the earth has been maintained by many writers. See EARTH and DELUGE.

The water of this vaſt abyſs, he aſſerts, does communicate with that of the ocean, by means of certain hiatuſes, or chaſms, paſſing betwixt it and the bottom of the ocean: and this and the abyſs he ſuppoſes to have one common centre, around which the water of both is placed; but ſo that the ordinary ſurface of the abyſs is not level with that of the ocean, nor at ſo great a diſtance from the centre of the other; it being, for the moſt part, reſtrained and depreſſed by the ſtrata of earth lying upon it: but wherever thoſe ſtrata are broken, or are ſo lax and porous that water can pervade them, there the water of the abyſs aſcends, fills up all the clefts and fiſſures into which it can get admittance, and ſaturates all the interſtices and pores of the earth, ſtone, or other matter, all round the globe, quite up to the level of the ocean.

The exiſtance of an abyſs, or receptacle of ſubterraneous waters, is controverted by Camerarius, and defended by Dr. Woodward chiefly by arguments; the firſt, drawn from the vaſt quantity of water which is ſaid to have covered the earth in the time of the deluge: the ſecond, from the conſideration of earthquakes, which he endeavours to ſhew are occaſioned by the violence of the waters in this abyſs. A great part of the terreſtrial globe has been frequently ſhaken at the ſame moment: which appears to argue, that the waters, which were the occaſion thereof, were co-extended with that part of the globe. There are even inſtances of univerſal earthquakes; which ſhew that the whole abyſs muſt have been agitated; for ſo general an effect muſt have been produced by as general a cauſe; and that cauſe can be nothing but the ſubterraneous abyſs. For the true cauſe of earthquakes, ſee EARTHQUAKE.

This abyſs is employed to ſolve ſeveral difficult phenomena; as the origin of ſprings and rivers; the level maintained in the ſurface of different ſeats, and their not overflowing their banks. To the effluvia emitted from this abyſs, ſome even attribute all the diverſities of weather, and changes in our atmoſphere; and what is more, the origin of every thing in the earth, or on its ſurface. Dr. Woodward has an epiſtle on the œconomy of the communication between it and the atmoſphere. Ray, and other authors, ancient as well as modern, ſuppoſe a communication between the Caſpian Sea and the ocean, by means of a ſubterranean abyſs; and to this they attribute it, that the Caſpian does not overflow, notwithſtanding the great number of large rivers it receives; of which Kemper reckons about fifty in the compaſs of ſixty miles. But the daily evaporation may be ſufficient for this purpoſe. See EVAPORATION, SEA, and SPRING.

The different arguments concernieg this ſubject may be ſeen collected and amplified in Cockburn's Enquiry into the Truth and Certainty of the Moſaic Deluge, p. 271, &c. After all, however, this amazing theory of a central abyſs is far from being demonſtrated; it will, perhaps, in ſeveral reſpects, appear inconſiſtent with ſound philoſophy, as well as repugnant to the phenomena of nature. In particular, if we believe any thing like elective attraction to have prevailed in the formation of the earth, we muſt believe that the ſeparation of the chaos proceeded from the union of ſimilar particles. It is certain that reſt is favourable to ſuch operations of nature. As, therefore, the central parts of the earth were more immediately quieſcent than thoſe remote from the centre, it ſeems abſurd to ſuppoſe that the heavier and denſer bodies gave place to the more light and fluid; that the central part ſhould conſiſt of water only, and the more ſuperficial part of a cruſt or ſhell. Vid. Whitehurſt's Enquiry into the original Formation of the Strata, &c. Hiſt. of the Earth. Journal des Scavans, tom. 58. p. 493. Burnet's Theory. Memoirs of Literature, vol. 8. p. 101. &c. Holloway's introduct. to Woodward's Hiſt. of the Earth. Acta Euruditorum, 1727, p. 813. Phyſico Theology, Diſc. II. Darwin's Botanic garden, in the notes. See DELUGE.

ABYSS is alſo uſed to denote the cavernous belly of a hollow mountain. In which ſenſe Mr. Tournefort deſcribes the abyſs of mount Ararat a horrible ſpectacle.

ABYSS, in the Septuagint verſion of the Old Teſtament, implies a great deep; as in the old tranſlations, the word has been rendered, "and darkneſs was on the face of the abyſs;" i.e. the *great deep;* which the tranſlators of the Engliſh bible have rendered *deep* only.

ABYSS is alſo uſed to denote hell, in which ſenſe the word is ſynonymous with Barathrum, Erebus, and Tartarus: in the Engliſh bible, "the bottomleſs pit." Cruden's Concordance.

ABYSS is alſo uſed metaphorically, for a thing not to be known or comprehended, on account of its immenſe extent or profundity. In which ſenſe it coincides with ſecret, inſcrutable, incomprehenſible, &c. The judgments of God are called a great abyſs.

ABYSSINIA, by ſome called *Higher Ethiopia*, and by the Arabians *Al Aabash*, is bounded on the north by Nubia; on the eaſt, by the Arabic gulph or Red Sea, and the kingdom of Adel; on the ſouth, by the kingdoms of Ajan, Alaba, and Gingiro; and on the weſt, by the kingdom of Goram and part of Gingiro; and is divided into a great number of provinces. The principal river is the Nile, which has its ſource in this country; and the moſt conſiderable lake, that of Dambea, which diſcharges itſelf into the Nile, is about 700 miles in length, and 90 in breadth. The air is pretty temperate in the mountains, and therefore their towns and ſtrong-holds are generally placed on them; but in the valleys it is hot and ſuffocating. The ſoil and face of the country is various. In ſome places there are nothing but rocks and profound caverns: in others, eſpecially where there are rivers, the land is exceeding fruitful; and the banks of theſe ſtreams are bordered with flowers of various kinds, many of which are unknown in Europe. The torrents in the rainy ſeaſon waſh a great deal of gold from the mountains.—Beſides the large towns, there are a great number of villages, which in ſome places are ſo thick ſown, that they look like one continued town: the houſes are very mean; being but one ſtory high, and built of ſtraw, earth and lime. In moſt of the towns the houſes are ſeparated by hedges, which are always green, and mixed with flowers and fruit-trees at a certain diſtance from each other, which affords an agreeable proſpect.—The government is monarchical. The ſovereign has the title of Negus, and is an abſolute prince. When he is in camp, the tents are ſo regularly diſpoſed as to have the appearance of a city; and there is a captain over every diviſion, to prevent diſorders and to execute juſtice.—The Abyſſinians in general are of an olive complexion, tall, graceful, and well featured. Their language is the Ethiopic, which bears a great affinity with the Arabic; but particular provinces have a different dialect. As to their religion, ſee the next article.

Manufactures are almoſt wholly wanting in this country; and the few trades which they have amongſt them are always conveyed from the father to the children. They ſeem indeed by their churches, and other ruinated places, to have had a knowledge of architecture. But the workmen were ſent for from other countries, and were forced to do all themſelves; ſo that when theſe fabrics were reared, eſpecially the imperial palace built by Peter Pais, a Portugueſe architect, the people flocked from all parts of Ethiopia to view it, and admired it as a new wonder of the world.—Gold, ſilver, copper, and iron, are the principal ores with which their mines abound in this extenſive part of Africa; but not above one third part is made uſe of by way of merchandize, or converted into money; of which they have little or no uſe in Abyſſinia. They cut their gold indeed into ſmall pieces for the pay of their troops, and for expences of the court, which is but a modern cuſtom among them; the king's gold, before the end of the 17th century, being laid up in his treaſury in ingots, with intent to be never carried out, nor ever uſed in any thing but veſſels and trinkets for the ſervice of the palace. In the lieu of ſmall money, they make uſe of rock-ſalt, as white as ſnow and as hard as ſtone. This is taken out of the mountain of Laſta, and put into the king's warehouſes; where it is reduced into tablets of a foot long, and three inches broad, ten of which are worth about a French crown. When they are circulated in trade, they are reduced into ſtill ſmaller pieces, as occaſion requires. This ſalt is alſo applied to the ſame purpoſe as common ſea-ſalt. With this mineral ſalt they purchaſe pepper, ſpices, and ſilk ſtuffs, which are brought to them by the Indians, in their ports in the Red Sea. Cardamums, ginger, aloes, myrrh, caſſia, civet, ebony-wood, ivory, wax, honey, cotton and linens of various ſorts and colours, are merchandizes which may be had from Abyſſinia; to which may be added ſugar, hemp, flax, and excellent wines, if theſe people had the art of preparing them. It is affirmed there are in this country the fineſt emeralds that are any where to be found; and, though they are found but in one place, they are there in great quantities, and ſome ſo large and ſo perfect as to be of almoſt ineſtimable value. The greateſt part of the merchandizes above mentioned, are more for foreign than inland trade. Their domeſtic commerce conſiſts chiefly in ſalt, honey, buck-wheat, grey peaſe, citrons, oranges, lemons, and other proviſions, with fruits and herbage neceſſary for the ſupport of life. Thoſe places that the Abyſſinian merchants frequent the moſt, who dare venture to carry their commodities by ſea themſelves, are Arabia Felix, and the Indies, particularly Goa, Cambaye, Bengal and Sumatra. With regard to their ports on the Red Sea, to which foreign merchants commonly reſort, the moſt conſiderable are thoſe of Mette, Azum, Zajalla, Maga, Dazo, Petea and Brava. The trade of the Abyſſinians by land is inconſiderable. There are, however, bands of them who arrive yearly at Egypt, particularly at Cairo, laden with gold duſt, which they bring to barter for the merchandizes of that country, or of Europe, for which they have occaſion. Theſe cafilas or caravans, if we may be allowed thus to call a body of 40 or 50 poor wretches who unite together for their mutual aſſiſtance in their journey, are commonly three or four months on their route, traverſing foreſts and mountains almoſt impaſſable, in order to exchange their gold for neceſſaries for their families, and return immediately with the greateſt part of the merchandize on their backs. Frequently the Jews or Egyptians give them large credit; which may ſeem ſurpriſing, as they are beyond recourſe if they ſhould fail of payment. But experience has ſhewn, that they have never abuſed the confidence repoſed in them; and even in the event of death, their fellow-travellers take care of the effects of the deceaſed for the benefit of their families, but in the firſt place for the diſcharge of thoſe debts contracted at Cairo.—It remains only to be obſerved, that one of the principal branches of trade of the Abyſſinians is that of ſlaves; who are greatly eſteemed in the Indies and Arabia for the beſt, and moſt faithful, of all that the other kingdoms of Africa furniſh. The Indian and Arabian merchants frequently ſubſtitute them as their factors; and, on account of their good ſervices and integrity, not only often give them their liberty, but liberally reward them.

ABYSSINIAN, in eccleſiaſtical hiſtory, is uſed as the name of a ſect, or herſey, in the Chriſtian church, eſtabliſhed in the empire of Abyſſinia. The Abyſſinians are a branch of the Copts or Jacobites; with whom they agree in admitting but one nature in Jeſus Chriſt, and rejecting the council of Chalcedon; whence they are alſo called Eutychians, and ſtand oppoſed to the Melchites. They are only diſtinguiſhed from the Copts, and other ſects of Jacobites, by ſome peculiar national uſages.—The Abyſſinian ſect or church is governed by a biſhop or metropolitan ſtyled *Abuna*, ſent them by the Coptic patriarch of Alexandria reſiding at Cairo, who is the only perſon that ordains prieſts. The next dignity is that of Komos, or Hegumenas, who is a kind of arch-preſbyter. They have canons alſo, and monks: the former of whom marry; the latter, at their admiſſion, vow celibacy, but with a reſervation: theſe, it is ſaid, make a promiſe aloud, before their ſuperior, to keep chaſtity; but add, with a low voice, *as you keep it*. The emperor has a kind of ſupremacy in eccleſiaſtical matters. He alone takes cognizance of all eccleſiaſtical cauſes, except ſome ſmaller ones reſerved to the judges; and confers all benefices, except that of Abuna.—The Abyſſians have at different times expreſſed an inclination to be reconciled to the ſee of Rome; but rather out of intereſt of ſtate, than any other motive. The emperor David, or the queen regent on his behalf, wrote a letter on this head to pope Clement VII. full of ſubmiſſion, and demanding a patriarch from Rome to be inſtructed by: which being complied with, he publicly abjured the doctrine of Eutychius and Dioſcorus in 1626, and allowed the ſupremacy of the pope. Under the emperor Seltan Seghed all was undone again; the Romiſh miſſionaries ſettled there had their churches taken from them, and their new converts baniſhed or put to death. The congregation *de propaganda* have made ſeveral attempts to revive the miſſion, but to little purpoſe.—The doctrines and ritual of this ſectary form a ſtrange compound of Judaiſm, Chriſtianity, and ſuperſtition. They practiſe circumciſion; and are ſaid to extend the practice to the females as well as males: they obſerve both Saturday and Sunday as ſabbaths: they eat no meats prohibited by the law of Moſes: women are obliged to the legal purifications; and brothers marry their brothers wives, *&c.* On the other hand, they celebrate the epiphany with peculiar feſtivity, in memory of Chriſt's baptiſm, whom they plunge and ſport in ponds and rivers, which has occaſioned ſome to affirm that they were baptiſed anew every year. Among the ſaints-days is one conſecrated to Pilate and his wife: by reaſon Pilate waſhed his hands before he pronounced ſentence on Chriſt, and his wife deſired him to have nothing to do with the blood of that juſt perſon. They have four lents: the great one commences ten days earlier than ours, and is obſerved with much ſeverity, many abſtaining therein even from fiſh, becauſe St. Paul ſays there is one kind of fleſh of men, and another of fiſhes. They allow of divorce, which is eaſily granted among them, and by the civil judge; nor do their civil laws prohibit polygamy itſelf. They have at leaſt as many miracles and legends of ſaints, as the Romiſh church: which proved no ſmall embarraſſment to the Jeſuit miſſionaries, to whom they produced ſo many miracles, wrought by their ſaints, in proof of their religion, and thoſe ſo well circumſtantiated and atteſted, that the Jeſuits were obliged to deny miracles to be any proof of a true religion; and in proof hereof to alledge the ſame arguments againſt the Abyſſinians, which Proteſtants in Europe alledge againſt the Papiſts. They pray for the dead, and invoke ſaints and angels; have ſo great a veneration for the virgin, that they charged the Jeſuits with not rendering her honour enough. Images in painting they venerate; but abhor all thoſe in relievo, except the croſs. They hold that the ſoul of man is not created; becauſe, ſay they, God finiſhed all his work on the ſixth day. They admit the apocryphal books, and the canons of the apoſtles, as well as the apoſtolical conſtitutions, for genuine. Their liturgy is given by Alvarez, and in Engliſh by Pagit.

ACACIA, in botany, *Egyptian Thorn*, or *Binding Bean Tree*, the name of a genus of trees, the characters of which are

things; or the mind, from a defect in its powers, is not able to apprehend it. Upon the latter ſuppoſition, all the uncertainty and fluctuation, in the opinions and judgments of mankind, admit of an eaſy ſolution: Let us therefore be modeſt, and aſcribe our errors to the real weakneſs of our own minds, and not to the nature of things themſelves. Truth is often difficult of acceſs: in order to come at it, we muſt proceed with caution and diffidence, carefully examining every ſtep; and, after all our labour, we will frequently find our greateſt efforts diſappointed, and be obliged to confeſs our ignorance and weakneſs. Labour and caution in their reſearches, in oppoſition to raſh and haſty deciſions, were the diſtinguiſhing characteriſtics of the diſciples of the ancient academy. A philoſopher, poſſeſſed of thoſe principles, will be ſlow in his progreſs: but will ſeldom fall into errors, or have occaſion to alter his opinion, after it is once formed. Vanity and precipitance are the great ſources of ſcepticiſm. Hurried on by theſe, inſtead of attending to the cool and deliberate principles recommended by the academy, ſeveral of our modern philoſophers have plunged themſelves into an abſurd and ridiculous kind of ſcepticiſm. They pretend to diſcredit ſubjects that are plain, ſimple, and eaſily comprehended; but give peremptory and deciſive judgments upon things that evidently exceed the limits of our capacity. Of theſe, Berkeley and Hume are the moſt conſiderable, Berkeley denied the exiſtence of every thing, excepting his own ideas. Mr. Hume has gone a ſtep further, and queſtioned even the exiſtence of ideas; but at the ſame time has not heſitated to give determined opinions with regard to eternity, Providence, and a future ſtate, miraculous interpoſitions of the Deity, &c. ſubjects far above the reach of our faculties. In his eſſay on the academical or ſceptical philoſophy, he has confounded two very oppoſite ſpecies of philoſophy. After the days of Plato indeed, the principles of the firſt academy were groſsly corrupted by Arceſilas, Carneades, &c. This might lead Mr. Hume into the notion, that the *academical* and *ſceptical* philoſophy were ſynonymous terms. But no principles can be of a more oppoſite nature, than thoſe which were inculcated by the old academy of Socrates and Plato, and the ſceptical notions which were propagated by Arceſilas, Carneades, and the other diſciples of the ſucceeding academies.

ACADEMIST, the member of an academy. This is not often uſed.—It is obſerved by the Pariſian *academiſts*, that ſome amphibious quadrupeds, particularly the ſea-calf or ſeal, hath his epiglottis extraordinarily large. *Ray on the Creation.*

ACADEMUS, or **ECADEMUS**, a citizen of Athens, who lived in the time of Theſeus, and having erected a fine villa, or pleaſure houſe, ſituated in a garden within a mile of the city, for ſports and gymnaſtic exerciſes, it was conſecrated to his memory after his death, and bore his name till the time of Plato; who held his philoſophical conferences in it with his friends, and thus immortalized the memory of the original proprietor, whoſe name has ever ſince been applied to places allotted for ſimilar ſcientific and philoſophical purſuits.

ACADEMY, [anciently and properly, with the accent on the firſt ſyllable, now frequently on the ſecond. *Academia*, Lat. from *Academus* of Athens, whoſe houſe was turned into a ſchool, from whom the *Groves of Academe* in Milton.] 1. An aſſembly or ſociety of men, uniting for the promotion of ſome art.—

> Our court ſhall be a little *academy*,
> Still and contemplative in living arts.
> *Shakes. Love's Lab. Loſt.*

2. The place where ſciences are taught.—Amongſt the *academies*, which were compoſed by the rare genius of thoſe great men, theſe four are reckoned as the principal; namely, the Athenian ſchool, that of Sicyon, that of Rhodes, and that of Corinth. *Dryd. Dufreſnoy.* 3. An univerſity. 4. A place of education, in contradiction to the univerſities or public ſchools. The thing, and therefor the name, is modern.

ACADEMY, **ACADEMIA**, in antiquity, a fine villa, or pleaſure houſe, ſituated in a garden, in the ſuburbs of Athens, about a mile from the city where Plato, and a number of his learned friends held their philoſophical conferences. It was ſo named from **ACADEMUS**, the original proprietor; (ſee laſt article,) tho' ſome authors pretend to derive the name from Cadmus, the Phœnician, who firſt introduced alphabetical characters into Greece. This villa was embelliſhed by Cimon with trees, walks and fountains; and Hipparchus, the ſon of Piſiſtratus built a wall round it; but in order to defray the charges, laid ſo heavy a tax on the people of Athens, that ever after Hipparchouteichion Hipparchus's tax, was uſed proverbially for any very extenſive piece of buſineſs. The trees planted by Cimon were afterwards cut down by Sylla, and employed during the ſiege of Athens, to make engines to batter down the wall of the city. Cicero had a ſimilar villa near Puzzuoli, which he called *Academia*, & where he entertained his philoſophical friends, & compoſed ſeveral of his works; particularly, his *Academical Queſtions*, and his books *De Natura Deorum.*

ACADEMY, among the moderns, is moſt commonly uſed for a regular ſociety of learned men, inſtituted for the improvement of one or more branches of the arts and ſciences, and generally under the patronage of a prince. Some authors confound academy with univerſity; but though much the ſame in Latin, they are very different things in Engliſh.—An univerſity is, properly, a body compoſed of graduates in the ſeveral faculties; of profeſſors, who teach in the public ſchools; of regents or tutors, and ſtudents, who learn under them, and aſpire likewiſe to degrees. Whereas, an academy is not intended to teach, or profeſs an art, ſuch as it is, but to improve it: it is not for novices to be inſtructed in it, but for thoſe that are more knowing; for perſons of diſtinguiſhed abilities to confer in, and to communicate their lights and diſcoveries to each other, for their mutual benefit and improvement. The firſt academy we read of, was eſtabliſhed by Charlemagne at the motion of Alcuin: it was compoſed of the chief wits of the court, the emperor himſelf being a member.—In their academical conferences, every perſon was to give an account of what ancient authors he had read; and each of them aſſumed the name of ſome ancient author, who pleaſed him moſt, or ſome celebrated perſon of antiquity. Alcuin, from whoſe letters we learn theſe particulars, took that of Flaccus, the ſurname of Horace; a young lord named Augilbert, took that of Homer; Adelard, biſhop of Corbie, was called Auguſtin; Reculſe, biſhop of Mentz, was Dametas; and the emperor himſelf, David. Moſt nations have now their academies, Ruſſia not excepted.

In giving an account of theſe uſeful inſtitutions, we ſhall arrange them according to their ſubjects, adhering, at the ſame time, as much as poſſible, to the alphabetical order.

1. ACADEMIES OF ANTIQUITIES; as 1. that at Cortona in Italy; and 2. at Upſal in Sweden. The firſt is deſigned for the ſtudy of Hetrurian antiquities: the other for illuſtrating the northern languages, and the antiquities of Sweden, in which notable diſcoveries have been made by it. The head of the Hetrurian academy is called *Lucumon*, by which the ancient governors of the country were diſtinguiſhed. One of their laws is to give audience to poets only one day in the year: another is to fix their ſeſſions, and impoſe a taſk of a diſſertation on each member in his turn.

3. THE ACADEMY OF MEDALS and INSCRIPTIONS AT PARIS was ſet on foot by M. Colbert, under the patronage of Louis XIV in the year 1663, for the ſtudy and explanation of ancient monuments, and perpetuating great and memorable events, eſpecially thoſe of the French monarchy, by coins, relievos, inſcriptions, &c. The number of members at firſt was confined to four or five, choſen out of the French academy: who met in the library of M. Colbert, from whom they received his majeſty's orders. The days of their meetings were not determined; but generally they met on Wedneſdays, eſpecially in the winter ſeaſon; but in 1691, the king having given the inſpection of the academy to M. de Pontchartrain, comptroller-general, &c. he fixed their meetings on Tueſdays and Saturdays. By a new regulation, dated the 16th of July 1791, the academy was compoſed of ten honorary members; ten aſſociates, each of whom had two deliberative voices; ten penſioners; and ten eleves or pupils. They then met every Tueſday and Wedneſday, in one of the halls of the Louvre, and had two public meetings yearly, one the day after Martinmas, and the other on the 16th after Eaſter. The claſs of eleves was afterwards ſuppreſſed, and united to the aſſociates. The king nominated their preſident and vice-preſident yearly; but their ſecretary and treaſurer were permanent. The reſt are choſen by the members themſelves, agreeably to the conſtitution of the academy. One of the firſt undertakings of this academy, was to compoſe, by means of medals, a connected hiſtory of the principal events of Louis XIV's reign; but this [illegible] with great difficulties, and after [illegible] it was interrupted for many years, [illegible] at length it was completed [illegible] duke of A[illegible] to the crown of Spain. [illegible]

[illegible]

per annum, and the foundation for 40 ſcholars. The late empreſs formed it into a ſeparate inſtitution, enlarged annual revenue to 12.000l. and augmented the number of ſcholars to 300; ſhe has alſo conſtructed, for the uſe and accommodation of the members, a large circular building, which fronts the Neva. The ſcholars are admitted at the age of 6, and continue until they have attained that of 18: they are clothed, fed, and lodged, at the expence of the crown. They are all inſtructed in reading and writing, arithmetic, the French and German languages, and drawing. At the age of 14. they are at liberty to chooſe any of the following arts, divided into four claſſes: Painting in all its branches of hiſtory, portraits, battles, and landſcapes; architecture; Moſaic; enamelling; &c. 2. Engraving on copper-plates, ſeal-cutting. &c. 3. Carving in wood, ivory, and amber. 4. Watch-making, turning, inſtrument-making, caſting ſtatues in bronze and other metals, imitating gems and medals in paſte and other compoſitions, gilding and varniſhing. Prizes are annually diſtributed to thoſe who excel in any particular art; and from thoſe who have obtained four prizes, twelve are ſelected, who were ſent abroad at the charge of the empreſs. A certain ſum is paid, to defray his travelling expences; and when they are ſettled in any town, they receive an annual ſalary of 60l. which is continued during four years. There is a ſmall aſſortment of paintings for the uſe of the ſcholars; and thoſe who have made great progreſs, are permitted to copy the pictures in the empreſs's collection. For the purpoſe of deſign, there are models in plaſter of the beſt antiques in Italy, all done at Rome, of the ſame ſize with the originals, which the artiſts of the academy are employed to caſt in bronze.

2. THE ROYAL ACADEMY OF ARTS IN LONDON, was inſtituted for the encouragement of *Deſigning*, *Painting*, Sculpture, &c. in the year 1768. This academy is under the immediate patronage of the king, and under the direction of 40 artiſts of the firſt rank in their ſeveral profeſſions. It furniſhes, in winter, living models of different characters to draw after; and in ſummer, models of the [illegible] to paint after. Nine of the ableſt Academicians are annually elected out of the 40, whoſe buſineſs it is to attend in rotation, to ſet the figures, to examine the performances of the ſtudents, and to give them neceſſary inſtructions. There are likewiſe four profeſſors, of Painting, of Architecture, of Anatomy, and of Perſpective, who annually read public lectures on the ſubjects of their ſeveral departments; beſides a preſident, a council, and other officers. The admiſſion to this academy is free to all ſtudents properly qualified to reap advantage from the ſtudies cultivated in it; and there is an annual exhibition of paintings, ſculptures, and deſigns, open to all artiſts of diſtinguiſhed merit.

[illegible] ACADEMY OF PAINTING and SCULPTURE AT PARIS. [illegible] happened between the maſter painters [illegible] in conſequence of which [illegible] Sarazin, Corneille, and [illegible] a petition [illegible] 1648. In [illegible] Mazarin a brevet [illegible] in parliament;

in gratitude for which favor, they choſe the cardinal for their protector, and the chancellor for their vice-protector. In 1663, by means of M. Colbert, they obtained a penſion of 4000 livres. The academy conſiſts of a protector; a vice-protector; a director; a chancellor; four rectors; adjuncts to the rectors; a treaſurer; four profeſſors, one of whom is profeſſor of anatomy, and another of geometry; ſeveral adjuncts and counſellors, an hiſtoriographer, a ſecretary, and two uſhers.

THE ACADEMY of PAINTING holds a public aſſembly every day for two hours in the afternoon, to which the painters reſort, either to deſign or to paint, and where the ſculptors model after a naked perſon. There are 12 profeſſors, each of whom keeps the ſchool for a month; and there are 12 adjuncts to ſupply their place in caſe of need. The profeſſor upon duty places the naked man as he thinks proper, and ſets him in two different attitudes every week. This is what they call ſetting the model. In one week of the month he ſets two models together, which is called ſetting the group. The paintings and models made after this manner, are called academies, or academy figures. They have likewiſe a woman who ſtands for a model in the public ſchool. Every three months, three prizes for deſign are diſtributed among the eleves or diſciples; two others for painting, and two for ſculpture every year.

4. There is alſo an ACADEMY of PAINTING, SCULPTURE, &c. at Rome, eſtabliſhed by Louis IV. wherein thoſe who have gained the annual prize at Paris are entitled to be three years entertained at the king's expence, for their further improvement.

5. The ACADEMY of ARCHITECTURE, eſtabliſhed by M. Colbert in 1671, conſiſting of a company of ſkilful architects, under the direction of the ſuperintendant of the buildings.

6. The ACADEMY of DANCING, erected by Louis IV. with privileges above all the reſt.

III. ACADEMIES of BELLES LETTRES are thoſe wherein eloquence and poetry are chiefly cultivated. Theſe are very numerous in Italy, and not uncommon in France.

1. The Academy of Arcadi was eſtabliſhed at Rome, in 1690, for reviving the ſtudy of Poetry and Belles-Lettres. Beſides moſt of the politer wits of both ſexes in Italy, this academy comprehends many princes, cardinals, and other eccleſiaſtics; and to avoid diſputes about pre-eminence, all appear maſked after the manner of Arcadian ſhepherds. Within ten years from its firſt eſtabliſhment, the number of academiſts amounted to ſix hundred. They hold aſſemblies ſeven times a year in a mead or grove, or in the gardens of ſome nobleman of diſtinction. Six of theſe meetings are employed in the recitation of poems and verſes of the Arcadi reſiding at Rome; who read their own compoſitions; except ladies and cardinals, who are allowed to employ others. The ſeventh meeting is ſet apart for the compoſitions of foreign or abſent members. This academy is governed by a Cuſtos, who repreſents the whole ſociety, and is choſen every four years, with a power of electing 12 others yearly for his aſſiſtance. Under theſe are two ſubcuſtodes, one vicar, or pro-cuſtos, and four deputies or ſuperintendants, annually choſen. The laws of the ſociety are immutable, and bear a near reſemblance to the ancient model. There are five methods of electing members. The firſt is by acclamation. This is uſed when ſovereign princes, cardinals, and ambaſſadors of kings, deſire to be admitted; and the votes are then given *viva voce*. The ſecond is called annumeration. This was introduced in favor of ladies and academical colonies, where the votes are taken privately. The third, repreſentation; was eſtabliſhed in favor of colonies and univerſities, where the young gentry are bred; who have each a privilege of recommending one or two members privately to be balloted for. The 4th, ſurrogation; whereby new members are ſubſtituted in the room of thoſe dead or expelled. The laſt, deſtination; whereby, when there is no vacancy for members, perſons of poetical merit have the title of Arcadi conferred upon them, till ſuch time as a vacancy ſhall happen. All the members of this body, at their admiſſion, aſſume new paſtoral names, in imitation of the ſhepherds of Arcadia. The academy has ſeveral colonies of Arcadi in different cities of Italy, who are all regulated after the ſame manner.

2. The Academy of Umidi at Florence has contributed greatly to the progreſs of the ſciences of the excellent Italian tranſlations given by ſome of its members, of the ancient Greek and Latin hiſtorians. Their chief attention is paid to the Italian poetry, at the ſame time that they have applied themſelves to the poliſhing of their language, which produced the Academy della Cruſca.

3. The Academy of Umoriſti, or Humoriſts, had its origin at Rome from the marriage of Lorenzo Marcini, a Roman gentleman; at which ſeveral perſons of rank were gueſts; and, it being carnival time, to give the ladies ſome diverſion, they took themſelves to the reciting of verſes, ſonnets, ſpeeches, firſt extempore, and afterwards premeditately; which gave them the denomination of Belli Umori. After ſome experience, coming more and more into the taſte of theſe exerciſes, they reſolved to form an Academy of Belles-Lettres; and changed the name of Belli Umori, for that of Umoriſti; chooſing for their device a cloud, which, after being formed of exhalations from the ſalt-waters of the ocean, returns in a gentle ſweet ſhower; with this motto from Lucretius, *Reget agmine dulci.*

IV. Chirurgical Academies; as, 1. That inſtituted ſome years ago, by public authority, at Paris; the members of which were not only to publiſh their own and correſpondents obſervations and improvements, but to give an account of all that is publiſhed on Surgery, and to compoſe a complete hiſtory of the art, by their extracts from all the authors, ancient and modern, who have wrote on it. A queſtion in Surgery is annually propoſed by the Academy, and a gold medal of 200 livres given to him who furniſhes the moſt ſatisfactory anſwer.

THE ACADEMY OF SURGERY AT VIENNA was inſtituted ſome years ago by the emperor Joſeph II. under the direction of the celebrated Brambilla. In this there were at firſt only two profeſſors; and to their charge the inſtruction of 130 young men was committed, 30 of whom had formerly been ſurgeons in the army. But of late the number both of the teachers and pupils have been conſiderably increaſed. Gabrieli was appointed to teach pathology and practice; Boeking, anatomy, phyſiology, and phyſic; Streit, medical and pharmaceutical ſurgery; Hunczowſky, ſurgical operations, midwifery, and the chirugia forenſis; and Plenk, chemiſtry and botany. To theſe alſo was added, Beindl, as profeſſor and extraordinary profeſſor of ſurgery and anatomy. Beſides this, the emperor, with his uſual liberality, provided a large and ſplendid edifice in Vienna, which affords accommodation for the teachers, the ſtudents, pregnant women, patients for clinical lectures, and ſervants. He alſo purchaſed for the uſe of this a medical library, which is open every day; a complete ſet of chiurgical inſtruments; an apparatus for experiments in natural hiſtory; a number of anatomical and pathological preparations; a collection of preparations in wax brought from Florence; and a variety of other uſeful articles. Adjoining to the building there is alſo a good botanical garden.—Among other parts of this inſtitution, three prize medals, each of the value of 40 florins, are to be annually beſtowed on thoſe ſtudents, who return the beſt anſwers to queſtions propoſed the year before. Theſe prizes are not entirely founded by the emperor, but are in part owing to the liberality of Brendelius, the protochirurgus at Vienna.

V. COSMOGRAPHICAL ACADEMIES; as that at Venice, called the ARGONAUTS. This was inſtituted at the ſolicitation of F. Coronelli, for the improvement of geographical knowledge. Its deſign was to publiſh exact maps, both celeſtial and terreſtial, as well particular as general, together with geographical, hiſtorical, and aſtronomical deſcriptions. Each member, in order to defray the expence of ſuch a publication, was to ſubſcribe a proportional ſum, for which he was to receive one or more copies of each piece publiſhed. For this end three ſocieties are ſettled, one under F. Monro, provincial of the minorities in Hungary; another under the Abbot Laurence au Rue Payenne, au Marais; the third under F. Baldigianai, Jeſuit, profeſſor of mathematics in the Roman college. The device of this academy is a terraqueous globe, with the motto *Plus ultra*; and at its expence all the globes, maps, and geographical writings, of F. Coronelli have been publiſhed.

VI. ECCLESIASTICAL ACADEMIES; as that at Bologna in Italy, inſtituted in 1687, employed in the examination of the doctrine, diſcipline, and hiſtory of each age of the church.

VII. ACADEMIES OF HISTORY. 1. THE ROYAL ACADEMY OF PORTUGUESE HISTORY AT LISBON. This academy was inſtituted by king John V. in 1720. It conſiſts of a director, four cenſors, a ſecretary, and 50 members; to each of whom is aſſigned ſome part of the eccleſiaſtical or civil hiſtory of the nation, which he is to treat either in Latin or Portugueſe. In the former, the hiſtory of each dioceſe, the prelates, ſynods, councils, churches, monaſteries, academies, perſons illuſtrious for ſanctity or learning, places famous for miracles or relics, muſt be diſtinctly related in 12 chapters. The latter comprizes the tranſactions of the kingdom, from the government of the Romans down to the preſent time. The members, who reſide in the country, are obliged to make collections and extracts out of all the regiſters, &c. which they have. Their meetings are held once [illegible]. A medal was ſtruck by this academy in honour [illegible]; on the front of which was his effigy, with [illegible] V. *Luſitanorum Rex*; and, on the [illegible] is repreſented ſtanding, and raiſing [illegible] before him, with the legend *Hiſtoria Reſurges*. Underneath are the following words in the abbreviature: REGia ACADEmia HISToriæ, INSTITuta VI. Idus Decembris MDCCXX.

2. Academy of Suabian Hiſtory at Tubingen, was l eſtabliſhed by ſome learned men, for publiſhing the beſt h rical writings, the lives of the chief hiſtorians, and comp new memoirs, on the ſeveral points and periods of theſ

VIII. Academies of Language; called by ſome G matical Academies: as

1. Academy della Cruſca at Florence, famous for it cabulary of the Italian tongue, was formed in 1582, ſcarce heard of before 1584, when it became noted f diſpute between Taſſo and ſeveral of its members. authors confound this with the Florentine academy. diſcourſes which Toricilli, the celebrated diſciple of G leo, delivered in the aſſemblies, concerning levity, the w the power of percuſſion, mathematics, and military a tecture, are a proof that theſe academies applied themſe to things as well as words.

2. The Academy of Fructiferi had its riſe in 161 an aſſembly of ſeveral princes and nobility of the cou who met with a deſign to refine and perfect the Ger tongue. It flouriſhed long under the direction of princ the empire, who were always choſen preſidents. In 1 the number of members aroſe to upwards of 900. I prior in time to the French academy, which only app in 1629, and was not eſtabliſhed into an academy be the year 1635. Its hiſtory is written in the German by George Neumark.

3. The French Academy, had its origin from a mee of men of letters in the houſe of M. Conrart, in 1629. 1635, it was erected into an academy, by Cardinal Rich for refining and aſcertaining the language and ſtyle.— number of its members was limited to 40; out of w director, chancellor, and ſecretary, were to be choſen: two former held their poſt for two months, the latter permanent. The members of this academy enjoyed ſev privileges and immunities, among which was that of being obliged to anſwer, before any court but that of king's houſehold. They met three times a-week in Louvre: at breaking up, forty ſilver medals were diſtrib among them, having on one ſide the king of France's and on the reverſe, *Protecteur de l'Academie*, with lau and this motto, *A l'Immortalité*. By this diſtribution, attendance of the *Academiſts* was ſecured, thoſe who w preſent receiving the ſurplus otherwiſe intended for the ſent. To elect or expel a member, at leaſt 18 were re ed; nor could any be choſen, unleſs he petitioned for by this expedient the affront of refuſal from perſons ele was avoided. Religious were not admitted; nor could nobleman, or perſon of diſtinction, be admitted on ano footing than as a man of letters. None were to be ex led, except for baſe and diſhoneſt practices; and there but two inſtances of ſuch expulſions, the firſt of M. nier for refuſing to return a depoſit, the other of the A Furetiere for plagiariſm.—The deſign of this academy to give not only rules, but examples of good writing. T began with making ſpeeches on ſubjects taken at about 28 of which were printed. They met with [illegible] poſition from the parliament at their firſt inſtitution; it ing two years before the patents granted by the king co be got regiſtered. They have been ſeverely ſatyrized, their ſtyle has been ridiculed as enervating inſtead of r ing the French language. They are alſo charged

ing ſurfeited the world by flattery, and having exhauſted all the topics of panegyric in praiſe of their founder; it being a duty incumbent on every member, at his admiſſion, to make a ſpeech in praiſe of the king, the cardinal, the chancellor Segnieur, and the perſon in whoſe place he was elected. The moſt remarkable work of this academy is a Dictionary of the French tongue; which, after 50 years ſpent in ſettling the words and phraſes to be uſed in writing, was at laſt publiſhed in 1694. The foundation of an *Academy* ſimilar to the above, was propoſed at Peterſburgh, by the learned princeſs Daſhkoff: to conſiſt of 60 members. The plan has been approved by the late empreſs, who has given a fund for its ſupport and eſtabliſhment.

4. THE ROYAL SPANISH ACADEMY AT MADRID held its firſt meeting in July 1713, in the palace of its founder, the duke d'Eſcalona. It conſiſted at firſt of eight acedemiſts, including the duke; to which number 14 others were afterwards added, the founder being choſen preſident or director. In 1714, the king granted them his confirmation and protection. Their device is a crucible in the middle of the fire, with this motto, *Limpia, Fya, y da Eſplendor;* "it purifies, fixes, and gives brightneſs." The number of members was limited to 24; the duke d'Eſcalona to be director for life, but his ſucceſſors to be choſen yearly, and the ſecretary to be permament. Their object, as marked out by the royal declaration, was to cultivate and improve the national language: they were to begin with chuſing carefully ſuch words and phraſes as have been uſed by the beſt Spaniſh writers; noting the low, barbarous, or obſolete ones; and compoſing a dictionary wherein theſe may be diſtinguiſhed from the former.

IX. ACADEMIES OF LAW; as that famous one at Beryta, and that of the Sitientes at Bologna.

X. MEDICAL ACADEMIES, as 1. that of the Naturæ Curioſi, in Germany; 2. that founded at Palermo in 1645; 3. that at Venice in 1701, which meets weekly in a hall near the grand hoſpital; and 4. that at Geneva in 1715, in the houſe of M. Le Clerc. The colleges of phyſicians at London and Edinburgh are alſo, by ſome, ranked in the number of *Academies*. 5. THE ACADEMY OF NATURÆ CURIOSI, called alſo the LEOPOLDINE ACADEMY, was founded in 1652, by Jo. Laur. Bauſchius, a phyſician; who, in imitation of the Engliſh, publiſhed an invitation to all phyſicians, to communicate their extraordinary caſes; and, meeting with ſucceſs, was elected preſident. Their works were at firſt publiſhed ſeparately; but in 1660, a new ſcheme was laid for publiſhing a volume of obſervations every year. The firſt volume appeared in 1684, under the title of Ephemerides, and the work has been continued with ſome interruptions and variations of the title, &c. In 1687, the emperor Leopold I. took the ſociety under his protection, granting the members ſeveral privileges, particularly that their preſidents ſhould he counts palatine of the holy Roman empire. This academy has no fixed reſidence, nor regular aſſemblies: inſtead of theſe there is a kind of bureau, or office, firſt eſtabliſhed at Breſlau, and afterwards removed to Nuremberg, where letters, obſervations, &c. from correſpondents or members are taken in. The academy conſiſts of a preſident, two adjuncts or ſecretaries, and colleagues or members without reſtriction. The colleagues, at their admiſſion, oblige themſelves to two things: firſt, to chooſe ſome ſubject out of the animal, vegetable, or mineral kingdom, to handle, provided it has not been treated by any colleague before; the ſecond, to apply themſelves to furniſh materials for the Annual Ephemerides. Each member to bear a ſymbol of the Academy, viz. a gold ring; whereon, inſtead of a ſtone, is a book open, and on the face thereof, an eye; on the other ſide the motto of the academy, *Nunquam otioſus.*

XI. THE MUSICAL ACADEMY AT PARIS conſiſts of the managers and directors of the opera.

XII. ACADEMIES OF POLITICS; as that lately at Paris, conſiſting of ſix perſons, who met at the Louvre, in the chamber where the papers relating to foreign affairs were lodged. But this academy proved of little ſervice, as the kings of France were unwilling to truſt any but their miniſters with the inſpection of forieign affairs.

XIII. ACADEMIES OF SCIENCES. Theſe comprehend ſuch as are erected for the purpoſe of improving natural and mathematical knowledge; and are likewiſe often called

PHILOSOPHICAL AND PHYSICAL SOCIETIES. The firſt of theſe was inſtituted at Naples about the year 1560, in the houſe of Baptiſta Porta. It was called ACADEMIA SECRETORUM NATURÆ; and was ſucceeded by, 2. The Academy of THE LYNCEI, founded at Rome by Prince Frederic Ceſi, towards the end of that century. Several members of this academy rendered it famous by their diſcoveries; among theſe are the celebrated Galileo. Several other academies were inſtituted about that time, which contributed greatly to the advancement of the ſciences; but none of them comparable to that of the *Lyncei.*

3. THE ACADEMY DEL CIMENTO made its appearance ſome years after the death of Toricelli, under the protection of Prince Leopold, afterwards Cardinal de Medicis. Redi was one of its chief members; and the ſtudies purſued by the reſt may be collected from thoſe curious experiments publiſhed in 1667, by their ſecretary Count Laurence Magulotti, under the title of *Saggi di Naturali Eſperienze;* a copy of which was preſented to the Royal Society, tranſlated into Engliſh by Mr. Waller, and publiſhed at London in quarto.

4. THE ACADEMY DEGL' INQUIETI, afterwards incorporated into that of DELLA TRACIA in the ſame city, followed the example of that of Del Cimento. Some excellent diſcourſes on phyſical and mathematical ſubjects, by Geminiano Montenori, one of its chief members, were publiſhed in 1667, under the title of *Perſieri Fiſico-Matematici.*

5. THE ACADEMY OF ROSSANO, in the kingdom of Naples, was originally an Academy of Belles Lettres, founded in 1540, and transformed into an Academy of Sciences in 1605, at the ſolicitation of the learned abbot Don Giacinto Gimma; who being made preſident, under the title of Promoter General thereof, gave them a new ſet of regulations. He divided the academiſts into the following claſſes: Grammarians, Rhetoricians, Poets, Hiſtorians, Philoſophers, Phyſicians, Mathematicians, Lawyers, and Divines, with a claſs apart for Cardinals, and perſons of quality. To be admitted a member, a man muſt have ſome degrees in the faculty. The members are not allowed to take the title of *Academiſts* in the beginning of their books, without a written permiſſion from their preſident, which is not granted till the work has been examined by the cenſors of the academy;

and the permiſſion is the greateſt honour the academy can confer, as they thereby adopt the work, and are anſwerable for it againſt all criticiſm that may be made upon it. To this law the preſident or promoter himſelf is ſubject; and no academiſt is allowed to publiſh any thing againſt the writings of another, without leave from the ſociety. Several other Academies of *Sciences* have been founded in Italy; but, for want of being ſupported by princes, did not continue long. The loſs of them, however, was abundantly repaired by the inſtitution of others ſtill ſubſiſting; ſuch as

6. The Academy of Filarmonici at Verona; and 7. of Ricovatri at Padua, where a learned diſcourſe on the origin of ſprings was delivered by Sig. Valliſnieri, firſt profeſſor of phyſic in the univerſity of that city, and which was afterwards printed. 8. The Academy of the Muti de Reggio, at Modena, the ſame Sig. Valliſnieri preſented an excellent diſcourſe on the ſcale of created beings, ſince inſerted in his Hiſtory of the generation of men and animals, printed at Venice in the year 1721.

9. F. Merſenne is ſaid to have given the firſt idea of a Philosophical Academy in France, towards the beginning of the 17th century, by the conferences of the naturaliſts and mathematicians occaſionally held at his lodgings; at which Gaſſendi, Des Cartes, Hobbes, Roberval, Paſcal, Blondel, and others aſſiſted. F. Merſenne propoſed to each certain problems to examine, or certain experiments to be made. Theſe private aſſemblies were ſucceeded by more public ones, formed by Mr. Montmort, and Mr. Thevenot the celebrated traveller. The French example animated ſeveral Engliſhmen of diſtinction and learning, to erect a

10. Philosophical Academy at Oxford, towards the cloſe of Oliver Cromwell's adminiſtration; which, after the Reſtoration, was erected into a Royal Society. See Society. The Engliſh example, in its turn, animated the French. Louis XIV, in 1666, aſſiſted by the counſels of Mr. Colbert, founded an academy of ſciences at Paris, with a ſufficient revenue to defray the charge of experiments, and ſalaries to the members, under the title of

11. The Royal Academy of Sciences. After the peace of the Pyrenees, Louis XIV, being deſirous of eſtabliſhing the arts, ſciences, and literature, upon a ſolid foundation, directed M. Colbert to form a ſociety of men of known abilities and experience in the different branches, who ſhould meet together under the king's protection, and communicate their reſpective diſcoveries. Accordingly Mr. Colbert, having conferred with thoſe who were at that time moſt celebrated for their learning, reſolved to form a ſociety of ſuch perſons as were converſant in natural philoſophy and mathematics, to join to them other perſons ſkilled in hiſtory and the various branches of erudition, along with thoſe who were entirely engaged in what are called the *Belles Lettres*, grammar, eloquence, and poetry. The geometricians and natural philoſophers were ordered to meet on Tueſdays and Saturdays, in a great hall in the king's library, where the books of mathematics and natural philoſophy were contained; the learned in hiſtory to aſſemble on Mondays and Thurſdays, in the hall where the books of hiſtory were contained, and the claſs of Belles Lettres to aſſemble on Wedneſdays and Fridays. All the different claſſes were likewiſe ordered to meet together upon the firſt Thurſday of every month; and by their reſpective ſecretaries make a report of the proceedings of the foregoing month. In a ſhort time, however, the claſſes of History, Belles Lettres, &c. were united to the French Academy, which was originally inſtituted for the improvement and refining the French language; ſo that the Royal Academy contained only two claſſes, viz. that of natural philoſophy and mathematics.

12. In 1696 the king, by a proclamation dated the 26th of January, gave this Academy a new form, and put it upon a more reſpectable footing. It was now to be compoſed of four kinds of members, viz. *honorary*, *penſionary*, *aſſociates* and *eleves*. Theſe laſt were a kind of pupils, or ſcholars, each of whom was attached to one of the penſionaries. The firſt claſs to contain 10 perſons, and each of the reſt 20. The honorary academiſts to be all inhabitants of France; the penſionaries all to reſide at Paris; eight of the aſſociates allowed to be foreigners; and the eleves all to live at Paris. The officers to be, a preſident, named by the king, out of the claſs of honorary academiſts; and a ſecretary and treaſurer to be permanent. Of the penſionaries, 3 to be geometricians, 3 aſtronomers, 3 mechanics, 3 anatomiſts, 3 chemiſts, 3 botaniſts, and the remaining two to be ſecretary and treaſurer. Of the 12 aſſociates, 2 to apply themſelves to geometry, 2 to botany, and 2 to chemiſtry. The eleves to apply themſelves to the ſame kind of ſcience with the penſionaries they were attached to; and not to ſpeak, except when called by the preſident. No regulars or religious to be admitted, except into the claſs of honorary academiſts; nor any perſon to be admitted either for aſſociate or penſionary, unleſs known for ſome conſiderable printed work, ſome machine, or other diſcovery. The aſſemblies were held on Wedneſdays and Saturdays, unleſs either of them happened to be a holiday, and then the aſſembly was held on the preceding day. To encourage the members to purſue their labours, the king engaged not only to pay the ordinary penſions, but even to give extraordinary gratifications, according to the merit of their reſpective performances; furniſhing withal the expence of the experiments and other enquiries neceſſary to be made. If any member gave in a bill of charges of experiments he had made, or deſired the printing of any book, and brought in the charges of engraving, the money was immediately paid by the king, upon the preſident's allowing and ſigning the bill. So, if an anatomiſt required live tortoiſes, for inſtance, for making experiments upon the heart, &c. as many as he pleaſed were brought him at the king's charge. Their motto was *Invenit et perfecit*. In the year 1716, the duke of Orleans, then regent, made an alteration in their conſtitution; augmenting the number of honoraries, and of foreigners capable of being aſſociates to 12; admitting regulars among ſuch aſſociates; and ſuppreſſing the claſs of eleves, as it appeared to be attended with ſome inconveniences, particularly that of making too great an inequality among the academiſts and being productive of ſome miſunderſtandings and animoſities among the members. At the ſame time he created other two claſſes; one conſiſting of 12 adjuncts, who, as well as the aſſociates, were allowed a deliberate voice in matters relative to ſcience; and the other of ſix free aſſociates, who were not attached to any particular ſcience, nor obliged to purſue any particular work. Since its re-eſtabliſhment in 1699, this academy has been very exact

act in publiſhing, every year, a volume containing either the works of its own members, or ſuch memoirs as have been compoſed and read to the academy, during the courſe of that year. To each volume is prefixed the hiſtory of the academy, or an extract of the memoirs, and, in general, of whatever has been read or ſaid in the academy; at the end of the hiſtory are the eulogiums on ſuch academiſts as have died that year. M. Rouille de Meſlay, counſellor to the parliament of Paris, inſtituted two prizes, one of 463, and the other of 370 dollars, to be alternately diſtributed by the parliament every year: the ſubject for the firſt to be upon phyſical aſtronomy, and thoſe for the latter on navigation and commerce. Notwithſtanding the advantages which the members of this academy enjoyed over others, in having their expences defrayed, and even being paid for their time and attendance, they have fallen under ſome imputations, particularly that of plagiariſm, or borrowing their neighbours' inventions; but with what juſtice we pretend not to ſay.

The French have alſo conſiderable academies in moſt of their great cities: as, 13. at MONTPELLIER, an ACADEMY of SCIENCES, on the like footing as that at Paris, being as it were a counter part thereof; 14. at THOULOUSE, an academy, under the denomination of Lanterniſts; and others at Niſmes, Arles, Lyons, Dijon, Bourdeaux, &c.

15. THE ROYAL ACADEMY OF SCIENCES AT BERLIN was founded in 1700, by Frederic I. king of Pruſſia, on the model of that of England; excepting that, beſides natural knowledge, it likewiſe comprehends the Belles Lettres. In 1718, it was ordained, that the preſident ſhall be one of the counſellors of ſtate, and nominated by the king. The members were divided into four claſſes; the 1ſt for proſecuting phyſics, medicine, and chemiſtry; the 2d for mathematics, aſtronomy, and mechanics; the 3d for the German language and the hiſtory of the country; and the 4th for oriental learning, particularly as it may concern the propagation of the goſpel among infidels. Each claſs to elect a director for themſelves, who ſhall hold his poſt for life. The members of all theſe claſſes have free admiſſion into the aſſemblies of any of the reſt. The great promoter of this inſtitution was the celebrated Mr. Leibnitz, who accordingly was made the firſt director. The firſt volume of their tranſactions was publiſhed in 1710, under the title of *Miſcellanea Berolinenſia*; and though they received but few marks of the royal favour for ſome time, they continued to publiſh new volumes in 1723, 1727, 1734, and 1740. At laſt, however, Frederic II, the late king of Pruſſia, gave new vigour to this academy, by inviting to Berlin ſuch foreigners as were moſt diſtinguiſhed for their merit in literature, and encouraged his ſubjects to proſecute the ſtudy and cultivation of the ſciences by giving ample rewards; and thinking that the academy, which till that time had bad ſome miniſter or opulent nobleman for its preſident, would find an advantage in having a man of letters at its head, he conferred that honour on M. Maupertuis. At the ſame time, he gave a new regulation to the academy, and took upon himſelf the title of its protector. The academiſts hold two public aſſemblies annually; one in January, on the late king's birth-day; and the other in May, on the day of his acceſſion to the throne. At the latter of theſe is given, as a prize, a gold medal of 50 ducats value: the ſubjects for the prize are ſucceſſively, natural philoſophy, mathematics, metaphyſics, and erudition.

16. THE IMPERIAL ACADEMY OF SCIENCES at PETERSBURGH was projected by Czar Peter the Great. That great monarch having during his travels, obſerved the advantage of public ſocieties for the encouragement and promotion of literature, formed the deſign of founding an academy of Sciences at St. Peterſburgh. By the advice of Wolf and Leibnitz, whom he conſulted on this occaſion, the ſociety was regulated, and ſeveral learned foreigners were invited to become members. Peter himſelf drew the plan, and ſigned it on the 10th of February 1724; but was prevented by the ſuddenneſs of his death, from carrying it into execution. His deceaſe, however, did not prevent its completion: for on the 21ſt of December, 1725, Catharine I, eſtabliſhed it according to Peter's plan; and on the 27th of the ſame month the ſociety was firſt aſſembled. On the 1ſt of Auguſt, 1726, Catharine honoured the meeting with her preſence, when profeſſor Bulfinger, a German naturaliſt of great eminence, pronounced an oration upon the advances made by the loadſtone and needle for the diſcovery of the longitude. The empreſs ſettled a fund of 22,120 dollars, per annum, for the ſupport of the academy; and fifteen members, all eminent for their learning and talents, were admitted and penſioned, under the title of Profeſſors in the various branches of literature and ſcience. The moſt diſtinguiſhed of theſe profeſſors were Nicholas and Daniel Bernoulli, the two De Liſles, Bulfinger, and Wolf. During the ſhort reign of Peter II, the ſalaries of the members were diſcontinued, and the academy was utterly neglected by the court; but it was again patroniſed by the empreſs Anne, who even added a ſeminary for the education of youth, under the ſuperintendance of the profeſſors. Both inſtitutions flouriſhed for ſome time under the direction of Baron Korf; but upon his death, towards the latter end of Anne's reign, an ignorant perſon being appointed preſident, many of the moſt able members quitted Ruſſia. At the acceſſion of Elizabeth, new life and vigour were again reſtored to the academy; the original plan was enlarged and improved; ſome of the moſt learned foreigners were again drawn to Peterſburgh; and, what was conſidered as a good omen for the literature of Ruſſia, two natives, Lomonoſof and Rumouſky, men of genius and abilities, who had proſecuted their ſtudies in foreign univerſities, were enrolled among its members. The annual income was increaſed to 47,326 dls. and ſoon afterwards the new inſtitution took place. The late empreſs, Catharine II, with her uſual zeal for promoting the diffuſion of knowledge, took this uſeful ſociety under her more immediate protection. She altered the court of directors greatly to the advantage of the whole body; ſhe corrected many abuſes, and infuſed a new ſpirit into their reſearches. By her particular recommendation, the moſt ingenious profeſſors viſited the various provinces of her vaſt dominions; and as the fund of the academy was not ſufficient to ſupply the whole expence of their ſeveral expeditions, the empreſs beſtowed a largeſs of 8880 dollars, which ſhe renewed as occaſion required. The purpoſe and intent of theſe travels will appear from the inſtructions given by the academy, to the ſeveral perſons who were engaged in them. They were ordered to purſue their enquiries upon the different ſorts of earths and waters; upon the beſt methods of cultivating the barren and deſert ſpots; upon the local diſorders incident to men and animals, and the moſt efficacious means of relieving them; upon the breeding of cattle, and particularly of ſheep; on the rearing of bees and

ſilk-worms; on the different places and objects for fiſhing and hunting; on minerals; on the arts and trades; and on forming a Flora Ruſſica, or collection of ingenious plants: they were particularly inſtructed to rectify the longitude and latitude of the principal towns; and make aſtronomical, geographical, and meteorological obſervations; to trace the courſe of the rivers; to take the moſt exact charts; and to be very diſtinct and accurate in remarking and deſcribing the manners and cuſtoms of the different people, their dreſſes, languages, antiquities, traditions, hiſtory, and religion; and, in a word, to gain every information which might tend to illuſtrate the real ſtate of the whole Ruſſian empire. In conſequence of theſe expeditions, perhaps no country can boaſt, within the ſpace of ſo few years, ſuch a number of excellent publications on its internal ſtate, on its natural productions, on its topography, geography, and hiſtory; on the manners, cuſtoms, and languages of the different people, as have iſſued from the preſs of this academy.

The firſt tranſactions of this ACADEMY were publiſhed in 1728, and intitled, *Commentarii Academiæ Scientiarum Imperialis Petropolitanæ ad an* 1726, with a dedication to Peter II. The publication was continued under this form until the year 1747, when its tranſactions were called *Novi Commentarii Academiæ, &c.* In 1777 the academy changed the title into *Acta Academiæ Scientiarum Imperialis Petropolitanæ*, and likewiſe made ſome alteration in the arrangement and plan of the work. The papers, which had been hitherto publiſhed in the Latin tongue, are now written either in that language or French; and a preface is added, ſtyled *Partie Hiſtorique*, which contains an account of its proceedings, meetings, admiſſions of new members, and other remarkable occurrences. Of the Commentaries, 14 volumes were publiſhed: the firſt of the New Commentaries made its appearance in 1750, and the twentieth in 1776. Under the new title of *Acta Academiæ*, ſeveral volumes have been given to the public, and two are printed every year. Theſe tranſactions abound with ingenious and elaborate diſquiſitions, upon various parts of ſcience and natural hiſtory, and which reflect the greateſt honour upon their authors; and it may not be an exaggeration to aſſert, that no ſociety in Europe has more diſtinguiſhed itſelf for the excellence of its publications, and particularly in the more abſtruſe parts of the pure and mixed mathematics.

The ACADEMY is ſtill compoſed, as at firſt, of 15 profeſſors, beſides the preſident and director. Each of theſe profeſſors has a houſe and an annual ſtipend from 883 to 2694 dollars. Beſides the profeſſors, there are 4 adjuncts, who are penſioned, and who are preſent at the ſittings of the ſociety, and ſucceed to the firſt vacancies.—The direction of the academy is at preſent conſigned to the Princeſs Daſhkoff. The building and aparatus of this academy are extraordinary. It has a fine library conſiſting of 36,000 curious books and manuſcripts, and an extenſive muſeum, in which the various branches of natural hiſtory, &c. are diſtributed in different apartments. It is extremely rich in native productions, having been collected by Pallas, Gmelin, Guldenſteadt, and other learned profeſſors, during their late expeditions thro' the Ruſſian empire. The ſtuffed animals and birds occupy one apartment. The chamber of rarities, the cabinet of coins, &c. contain innumerable articles of the higheſt curioſity and value. The ſociety has this modeſt motto, *Paulum*.

17. The ACADEMY OF SCIENCES AT BOLOGNA, called the INSTITUTE OF BOLOGNA, was founded by Count Marſigli, in 1712, for the cultivation of phyſics, mathematics, medicine, chemiſtry and natural hiſtory. Its hiſtory is written by M. de Limiers, from memoirs furniſhed by the founder himſelf.

18. The ACADEMY OF SCIENCES AT STOCKHOLM, or ROYAL SWEDISH ACADEMY, owes its inſtitution to ſix perſons of diſtinguiſhed learning, among whom was the celebrated Linnæus. They met firſt on the 2d of June, 1739, and formed a private ſociety, in which ſome diſſertations were read; and in the latter end of the ſame year their firſt publication made its appearance. As the meetings continued, and the members increaſed, the ſociety attracted the notice of the king, who, on the 31ſt of March, 1741, incorporated it under the name of the Royal Swediſh Academy. Not receiving any penſion from the crown, it is only under the protection of the king, being directed, like the Royal Society of London, by its own members. It has now a large fund, which has chiefly ariſen from legacies and other donations; but a profeſſor of experimental philoſophy, and two ſecretaries, are ſtill the only perſons who receive any ſalaries. Each of the members reſident at Stockholm becomes preſident by rotation, and continues in office for three months. There are two ſpecies of members, native and foreign: the election of the former is held in April, and of the latter in July: no money is paid at the time of admiſſion. The diſſertations read at each meeting are collected and publiſhed four times in the year; they are written in the Swediſh language, and printed in 8vo. and the annual publications make a volume. The firſt 40 volumes, which were finiſhed in 1779, are called the Old Tranſactions; for in the following year the title was changed into that of New Tranſactions. The late king was ſometimes preſent at the ordinary meetings, and particularly at the annual aſſembly in April for the election of members. Any perſon who ſends a treatiſe which is thought worthy of being printed, receives the tranſactions for that quarter gratis, and a ſilver medal, which is not eſteemed for its value, being worth only 66½ cents, but for its rarity and the honour conveyed by it. All the papers relating to agriculture are put forth ſeparately, under the title of *Oeconomica acta*. Annual pr in money and gold medals, principally for the encou ment of agriculture and inland trade, are alſo diſtrib by the academy. The fund for theſe priſes is ſupplied fr private donations.

19. The ROYAL ACADEMY OF SCIENCES AT COPENHAGEN, owes its inſtitution to the zeal of ſix literati, whom Chriſtian VI. in 1742, ordered to arrange his cabinet of medals. The count of Holſtein was the firſt preſident; and the ſix perſons who firſt formed the deſign, were J Gram, Joachim Frederick Ramus, Chriſtian Logis Sch Mark Weldickey, Eric Pontoppidan, and Bernard Moe Theſe perſons occaſionally meeting for that purpoſe, extended their deſigns; aſſociated with them others who were eminent in ſeveral branches of ſcience; and forming a kind of literary ſociety, employed themſelves in ſearching into, and explaining the hiſtory and antiquities of their country. The count of Holſtein warmly patronized this ſociety, and recommened it ſo ſtrongly to Chriſtian VI. that, in 1744, he took it under his protection, called it the Royal A my of Sciences, endowed it with a fund, and ordere

members to join to their former purſuits, natural hiſtory, phyſics, and mathematics. In conſequence of the royal favour, the members engaged with freſh zeal in their purſuits; and the academy has publiſhed 15 volumes in the Daniſh language, ſome whereof have been tranſlated into Latin.

20. The American Academy of Arts and Sciences in Boſton, was incorporated by an act of the Legiſlature of the ſtate of Maſſachuſetts, May 4th, 1780, for promoting the knowledge of the antiquities of America, and of the natural hiſtory of the country; for determining the uſes to which its various productions might be applied; for encouraging medicinal diſcoveries, mathematical diſquiſitions, philoſophical inquiries and experiments; aſtronomical, meteorological and geographical obſervations; and improvements in agriculture, manufactures, and commerce; and, in ſhort, for cultivating every art and ſcience, which may tend to advance the intereſt, honour, dignity, and happineſs of a free and independent people. The number of members is never to be more than 200, nor leſs than 40.

This inſtitution was formed amidſt the din of arms, and the very rapid progreſs which has been made in this ſtate, in the *arts* and *ſciences*, are no doubt, in a great meaſure, owing to the exertions of this ſociety, which may not only claim the honour of being one of the firſt, but moſt uſeful of any in the United States. It was founded under the auſpices and influence of James Bowdoin, Eſq. at that time governor of the ſtate, who was choſen its firſt preſident, and continued in that office till his death, which happened in 1790. To this body, Governor Bowdoin, who was ever a warm and active patron, bequeathed his valuable library, conſiſting of upwards of twelve hundred volumes, upon every branch of ſcience, and in almoſt every language, together with the ſum of one hundred pounds Maſſachuſetts currency, (333 dollars.)

For a farther account of ſimilar public inſtitutions, under other titles, ſee the articles Board, Society, Institute and College.

Academy is alſo applied in a more reſtricted ſenſe, to ſchools and private ſeminaries of learning. Thus in Philadelphia, New-York, Boſton, &c. there are well regulated Commercial Academies, and others under various denominations, for teaching geography, mathematics, languages, writing, book-keeping, drawing, and the other branches of uſeful education.

Academy is alſo applied to riding-ſchools, where young gentlemen are taught to ride the great horſe; and the ground allotted for this purpoſe, is uſually ſtiled, *the Manege.*

Academy is likewiſe uſed to denote a kind of collegiate ſeminary where youth are inſtructed in arts and ſciences. Frederick I. king of Pruſſia eſtabliſhed an academy of this kind in Berlin, in 1703, for the education of young noblemen. The expence of the ſtudents was moderate, the king having undertaken to pay the extraordinaries. It was entitled the Academy of Princes, but has now loſt much of its original ſplendor. The academy of arts, before mentioned, inſtituted at Peterſburgh by the Empreſs Elizabeth, belongs properly to this claſs. The ancient Romans had a kind of *military academies*, eſtabliſhed in all the cities of Italy under the titles of *Campi Martii.* And the Greeks, beſides academies of this kind, had military profeſſors called *Tactici*, who taught all the higher offices of war. The Britiſh have two royal academies of this kind, the one a ſort of military academy at Woolwich, for teaching fortification, gunnery, &c. and the other at Portſmouth, which may be ſtiled a naval or maritime academy, for navigation, drawing, &c. The modern Jews have alſo their collegiate academies in moſt of the great cities in Europe and Aſia, where their Rabbins inſtruct their youth in the Hebrew language and the ſecrets of the Cabbala, and explain the Talmud to them. Thoſe of Tiberias and Babylon have been the moſt noted of their ancient academies. The non-conformiſt clergy in England, who do not approve of the common univerſity education, are educated in private collegiate academies; the principal of which are in Hackney near London, Warrington, and Daventry.

Academy Military of the United States. A propoſal for a military academy for the United States, upon a very extenſive plan, was ſome years ago laid before the Congreſs, by the ſecretary at war; but it was at that time no farther acted upon, than that the Preſident was authorized by an act paſſed 16th July, 1798, "to appoint a number not exceeding four teachers of the arts and ſciences, neceſſary for the inſtitution of the Artilleriſts and Engineers, who ſhall be entitled to the monthly pay of fifty dollars and two rations." Some teachers have been already appointed by the Preſident, in conformity to this act; and though the beginning be but ſmall, yet when the growing conſequence of theſe ſtates is taken into conſideration, it will no doubt, be the foundation of an eſtabliſhment, which may, in a ſhort time, in point of utility, rival the moſt celebrated inſtitutions of the kind, in the old world.

ACADIE, or Acadia, a country in N. America, now called Nova Scotia, or New Scotland. See Nova Scotia.

ACÆNA, in botany, a genus of the monogynia order, belonging to the tetrandia claſs of plants; the characters of which are theſe: the calyx is a perianthium, conſiſting of four leaves, which are ovate, concave, equal, and perſiſtent; there is no corolla: the ſtamina conſiſts of four equal middle-ſized filaments oppoſite to the calyx; the antheræ are quadrangular, twin, erect: the piſtillum has an inverſely ovate hiſped germ; the ſtylus is ſmall, and inflected on one ſide; and the ſtigma is a ſmall thickiſh coloured membrane, divided into many fragments: the pericarpium is an inverſely ovated, dry, one-celled berry, covered with prickles bent backwards: the ſeed is ſingle. There is only one ſpecies, a native of Mexico.

ACAIAIBA, or Acaiou, in botany, a name given to the tree that produces the Caſhew nuts. See Anacardium.

ACALANDRUS, the ancient name of a river that falls into the bay of Tarentum, near Metapontum; now called *Fueme de Roſeto.*

ACALYPHA, the Three-ſeeded Mercury, a genus of plants belonging to the monoecia monadelphia claſs. The characters of this genus, are the following.—Male flowers crowded above the female ones: the calyx is a three or four-leaved perianthium, the leaflets roundiſh, concave, and equal: the corolla is wanting: the ſtamina have from 6 to 18 filaments, which are ſhort, crowded, and connected at the baſe; the antheræ are roundiſh.—Female flowers fewer, placed beneath, and received into a large divided involucrum: the calyx is a perianthum, conſiſting of three leaflets, which are not concave, converging, ſmall, and perſiſtent: no corolla:

The piſtillum has a roundiſh germen : the ſtyli are three, branchy, oftener tripartite, and long : the ſtigmata are ſimple : the pericarpium has a roundiſh, triculated, trilocular capſule : the valvulets gaping two ways : the ſeeds are ſolitary, roundiſh, and large. This genus ranks in the 38th natural order, Tricoccæ. There are five ſpecies, all natives of Virginia.

ACAMANTIS, in ancient geography, the original name of the iſland of Cyprus, from one of its promontories, called *Acamas*.

ACAMANTIUM, a city of Phrygia, founded by Acamas, the ſon of Theſeus.

ACAMAS, the ſon of Theſeus, who followed his father to the ſiege of Troy, and being ſent along with Diomedes to the Trojans, to ſolicit the reſtoration of Helen, Laodice, one of Priam's daughters, had a ſon by him, called Munitus. He was one of the Grecians who afterwards concealed themſelves in the wooden horſe.

ACAMATOS, in medicine, that diſpoſition of a limb, which is equally diſtant from flexion and extenſion.

ACAMBOA, a kingdom on the coaſt of Guinea, in Africa, whoſe king is abſolute, and all the natives ſlaves ; which, however, does not prevent them from being haughty and inſolent.

ACAMEEH, among chemiſts, the ſcoriæ of ſilver. Alſo a ſuperfluity of the radical moiſture.

ACANACEOUS Plants, ſuch as are armed with prickles, like the thiſtle, &c.

ACANAPHORA, in botany, a name given by ſome to the *Jacea*, or common knap-weed.

ACANGIS, adventurers, or ravagers ; a name given by the Turks to their huſſars, who are ſent out to procure intelligence, and ravage the enemy's country.

ACANNY, an inland country on the Gold Coaſt of Guinea, which affords the beſt gold, and in great plenty : alſo a town or village in that country. Long. 75. 30. E. Lat. 8. 30. N.

ACANOR, a kind of chemical furnace. See Athanor.

ACANTHA, in anatomy, the protuberances of the Vertebræ of the back, commonly called the *Spinæ dorſi*, or the ſpine.

Acantha, in botany, the prickle of a plant.

Acantha, in zoology, the ſpine, or prickly fins of a fiſh.

ACANTHABOLUS, in ſurgery, an inſtrument for pulling prickles, thorns, or the like out of the ſkin ; fiſh bones out of the œſophagus, or gullet, or fragments of weapons, &c. out of wounds. In figure it reſembles a pair of pincers, but is ſometimes made crooked for more conveniently entering the fauces.

Acanthe Arabica, in botany, a name given by ſome of the Greek writers to a plant called alſo *leucacanthe*, and by the Arabian phyſicians *bunkon*. It was a prickly plant, whoſe roots were ſomewhat like thoſe of the cyprus, and compoſed of ſeveral knots or joints, and of a bitter taſte. It was brought for medicinal uſe from the Eaſt Indies, and ſome parts of Arabia, and was the root of the *angulia* of Avicenna and others.

ACANTHIAS, in ichyology, a name given by ſome authors to the thorn-back, a fiſh, the ſkin of which is uſed by our artificers in poliſhing, and called by them ſimply fiſh-ſkins

ACANTHICE, maſtich, among ancient naturaliſts, a kind of gum, yielded by the herb helxine. Gaza explains it by *ſpinalis maſticha*.

ACANTHINE, *acanthinus*, denotes a thing relating to, or reſembling the herb acanthus. In this ſenſe we read of *acanthina, veſtimenta*, acanthine garments, of which we have two different explanations. Some underſtand by it a kind of embroidery, wrought in imitation of the Egyptian acanthus, or thorn, whoſe ſmall ſprigs are much interlaced. Others will have it a peculiar kind of ſilken ſtuff, made of the lanugo, or down of a plant of the thiſtle kind, growing in Sicilly and the eaſt.

ACANTHION, among naturaliſts, a plant of the thorn, or rather of the thiſtle kind : whoſe down being cleanſed from the prickles, was manufactured into a kind of ſtuff, not unlike ſilk.

ACANTHOPTERYGII, in ichthyology, a claſs of fiſhes, in the Linnæn ſyſtem, the character of which is, that the rays of the fins are bony, and ſome of them prickly at the extremities. This claſs contains 17 genera.

ACANTHOS, a maritime town of Macedonia, Weſt of mount Athos, now called *Eriſſa*. Near this was Xerxes's ditch, or canal, whereby he attempted to ſeparate Athos from the continent, to convey his ſhips without doubling the mount into the Singitic bay.

ACANTHUS. The name of the herb bears-breech, remarkable for being the model of the foilage on the Corinthian chapiter.—

> On either ſide
> *Acanthus*, and each od'rous buſhy ſhrub,
> fenc'd up the verdant wall. *Milt. Par. Loſt.*

Acanthus, *Bear's-breech*, or *Brank-urſine*, in botany : a genus of the angioſpermia order, belonging to the didynamia claſs of plants ; and ranking in the 40th natural order, Perſonatæ. The generic characters are ; The calyx is a perianthium with leaflets of three alternate pairs unequal and perſiſtent ; The corolla is one petal'd and unequal ; the tubus very ſhort, cloſed with a beard ; no upper-lip ; the under one very large, flat, ſtraight, very broad, three lobed, and obtuſe : The ſtamina have four ſubulated filaments ſhorter than the corolla ; the two ſuperior rather longer, recurvate, and incurved at the top ; the antheræ are oblong, compreſſed obtuſe, lateral, parallel, and villous before : The peſtillum has a conic germen ; a filiform ſtylus, the length of the ſtamina ; and two acute lateral ſtigmata : The perianthium is an acutely ovated bilocular capſule, with a lateral partition : The ſeeds one or two, fleſhy and gibbous.—There are five ſpecies, viz. 1. The mollis, or common bear's-breach, a native of Italy, is the ſort that is uſed in medicine, and is ſuppoſed to be the mollis acanthus of Virgil ; the leaves are famous for having giving riſe to the capital of the Corinthian pillars. 2. The ſpinoſus, or prickly bear's-breach ; the leaves of which are deeply jagged in very regular order, and each ſegment is terminated with a ſharp ſpine, as are alſo the footſtalks of the leaves of the empalement of the flower, which renders it troubleſome to handle them. 3. Hicifolius, or ſhrubby bear's-breech, grows naturally in both the Indies. It is an evergreen ſhrub which riſes about four feet high ; and is divided into many branches, garniſhed with leaves, like thoſe of the common holly, and armed with ſpinæ in the ſame manner : the flowers are white, and ſhaped like thoſe of common acanthus, but ſmaller. 4. The nigra, or Portugal bear's-breech, with ſmooth ſinuated leaves of a livid green colour, was diſcovered in Portugal by Dr. Juſſieu of the royal garden at Paris. 5. The middle bear's-breech with entire leaves, having ſpines on their border, is ſuppoſed to be the acanthus of Dioſcorides.—They are all perennial plants. The firſt and ſecond ſpecies may be propagated either by ſeeds, or by offsets from the roots. The beſt way is to raiſe them from the ſeeds; which ſhould be ſown about the end of March, in a light ſoil. They are beſt dropped at diſtances into ſhallow drills, and covered three quarters of an inch with mould. When the plants are come up, the ſtrongeſt ſhould be marked, and the reſt ſhould be pulled up, that they may ſtand at a yard diſtance one from another. They require no other culture but to keep them clean from weeds. The 3d, 4th, and 5th ſorts are propagated only by ſeeds; which, as they do not ripen in Europe, muſt be obtained from the places in which they grow naturally: the plants are ſo tender that they cannot be preſerved out of the ſtove in this country.—The firſt ſpecies is the ſort uſed in medecine. All the parts of it have a ſoft ſweetiſh taſte, and abound with a mucilaginous juice: its virtues do not ſeem to differ from thoſe of althea and other mucilaginous plants.

ACANTHUS, in architecture, an ornament repreſenting the leaves of the acanthus, uſed in the capitals of the Corinthian and Compoſite orders.

ACAPATLI, in botany, a name uſed by ſome authors for the plant which produces the long pepper, uſed in medicine.

ACAPULCO, a conſiderable town and port in Mexico, on the South Sea. It has a fine harbour from whence a ſhip annually ſails to Manilla in the Philippine Iſlands, near the coaſt of China in Aſia; and another returns annually from thence with all the treaſures of the Eaſt Indies, ſuch as diamonds, rubies, ſaphires, and other pracious ſtones; the rich carpets of Perſia; the camphire of Borneo; the Benjamin and ivory of Pegu and Cambodia; the ſilks, muſlins, and calicoes of the Mogul's country; the gold duſt, tea, china ware, ſilk, and cabinets of China and Japan; beſides cinnamon, cloves, mace, nutmegs, and pepper; inſomuch that this ſingle ſhip contains more riches than many whole fleets. The goods brought to Acapulco are carried to the city of Mexico by mules and pack horſes; and from thence to Vera Crux on the North Sea, in order to be ſhipped for Europe. Acapulco itſelf is a ſmall place, conſiſting of about 200 or 300 thatched houſes. Ships arrive at the port by two inlets, ſeparated from each other by a ſmall iſland; the entrance into them in the day time is by means of a ſea-breeze, as the ſailing out in the night time is effected by a land breeze. A wretched fort, 42 pieces of cannon, and a garriſon of 60 men defend it. It is equally extenſive, ſafe, and commodious. The baſon, which conſtitutes this harbour, is ſurrounded by lofty mountains, which are ſo dry, that they are even deſtitute of water. The air here is hot, heavy, and unwholeſome; to which none can habituate themſelves, except certain negroes, that are born under a ſimilar climate, or ſome mulattoes. This feeble and miſerable colony is crowded with a vaſt acceſſion to its number, upon the arrival of the galloons; traders flocking here from all the provinces of Mexico, who come to exchange European toys, their own cochineal, and about 1,942,500 dollars of ſilver for ſpices, muſlins, printed linens, ſilk, perfumes, and the gold works of Aſia. Long. 27. 20. W. Lat. 17. 0. N.

ACARA, in ichthyology, the name of a fiſh caught in the freſh waters of the Brazils, and eſteemed a very dilicate and well taſted one. It ſeldom exceeds three or four inches in length, and has a high back like the perch. Its mouth is ſmall, and its jaws rough like a file. It has one long back fin, which is ſupported by a great number of rigid and prickly rays, and reaches to the tail. Its ſcales are large; its back is of a gloſſy brown; its ſides and belly white; its tail is not forked. It has a large black ſpot on the middle of each ſide, and another near the tail. Its fins are all brown.

ACARAAYA, in ichthyology, the name of a fiſh caught on the Braſilian ſhores, and by ſome called alſo Garanha. It grows to three feet in length, and is of the ſhape of our carp. Its lower jaw is furniſhed with an even range of ſharp teeth like little needles. Its upper jaw has two very long ones. Its eyes are large, and their iris red. Its tail is broad, and a little forked. Its ſcales are of a moderate ſize, and of a ſilver hue, with an admixture of purple. Its belly, and the under part of its head, are wholly white, with a ſlight edge of red. It is eaten in Braſil, both freſh and ſalted.

ACARAMUCU, in ichthyology, the name of a fiſh found in the weſtern ocean, and in ſome other parts of the world. It is a very ſingular and remarkable animal. It is of a flatted but long body, and not thick. It is uſually about 8 or 10 fingers breadth long, and about 4 broad. Its mouth is round but very ſmall, ſcarce admitting the end of one's little finger. In the fore part of the mouth, both above and below, there are triangular and ſharp-teeth. On each ſide, juſt below the eyes, there are two ſquariſh fiſſures, which ſerve in the place of gills; and on the ridge of the back, directly behind the eyes, there is placed a fine ſlender pointed horn, which ſtands nearly erect, but bending a little backward; this is of a cylindrical ſhape, and four fingers breadth long. It has no ſcales, but a ſmooth ſkin, and is of a mixed greyiſh and browniſh colour. It feeds on ſea-weeds; and its fleſh is not eatable.

ACARAPEBA, in ichthyology, the name of an American fiſh, called alſo by ſome *broſeme*. It has a ſomewhat broad and flat body, covered with large ſcales of a fine ſilver whiteneſs. It grows to a foot in length, and to four or five fingers in breadth. It has a large mouth, but without teeth; and its tail is forked. It has one long black fin, the anterior rays, or naves, of which are rigid and prickly, the hind naves ſoft and flexible. The fins are all like the reſt of the body, of a pure white. This fiſh ſeems a kind of Smaris.

ACARAPINIMA, in ichthyology, the name of a Braſilian fiſh, of the Cantharus kind, and ſeemingly of the ſame ſpecies with the Cantharus of the Mediterranean.

ACARAPITAMBA, in ichthyology, the name of a fiſh caught in the Braſilian ſeas, of an oblong figure, reſembling the mullet, and growing two feet or more in length. Its mouth and teeth are very ſmall. It has one long fin on the back, running very nearly to the tail, which is ſupported by rigid and prickly rays. Its tail terminates in two oblique hornes. Its ſcales are large, and of a purpliſh colour, with a fine admixture of blue; and along the middle of each ſide there runs, from the gills to the tail, a very broad and beautiful gold-coloured line. Its back, down to this line, is variegated alſo with ſmall gold-coloured ſpots; and the ſides under the line are very beautifully variegated with ſmall and fine longitudinal, but ſhort gold-coloured lines, of a ſomewhat paler colour than the broad one. Its belly is white and its fins yellow.

ACARAPUCU, in ichthyology, the name of a Braſilian fiſh, caught in the freſh waters, and growing to 18 inches in length. It is of a rounded body; and its mouth is ſmall and not prominent. It has lips which it can hide or ſuffer to appear at pleaſure, and has no teeth. Its tail is long and forked; its ſcales are of a ſilvery hue. On the back it has a fine golden gloſs, ſhining in the whiteneſs; and on the ſides five or ſix large blue ſpots. Its back and ſide fins are of a pale blue, as is alſo the tail. the belly fins are yellowiſh. It is a well taſted fiſh.

ACARAUNA, in ichthyology, an American fiſh, of which there are two ſpecies; the one called Acarauna, without any addition; and the other

Acarauna Quadrata, or the Square Acarauna; and by the ſailors called *Old Wife.*—The former grows to about four or five inches long, and is conſiderably broad and flat. It is covered with ſmall blackiſh ſcales; its tail is large and forked. It has two fins under the gills, two more under the belly, and a long one running all along the back, and another anſwering it from the anus to the tail. Its mouth is ſmall and narrow, and its teeth very ſmall. Its eyes are alſo ſmall: and on each ſide, near the tail, it has an extremely ſharp thorn, or prickle: theſe it can draw in at pleaſure into its ſides, and occaſionally throw them out to annoy other fiſhes.—The latter is much of the ſame ſize. It is frequently preſerved in the cabinets of the curious, and is found there, of a pale brown, with its tail and the fore part of the body of a pale yellow, or ſtraw-colour. It is covered with ſcales, furrowed with ſlight parallel lines, except that the anterior part of the head is covered with a naked, but rough ſkin. The top of the head riſes into an acute angle; the fore-head is flat; and the eyes round and large, and placed high. Its mouth is every ſmall; and its teeth are very ſlender, and ſtand cloſe together. The upper jaw has on each ſide four ſharp thorns growing from it, and the lower two very large and ſharp ones, bending downward, and in ſhape and ſtructure reſembling a cock's ſpur; and from theſe there runs up a row of ſmall thorns to the eye.

ACARI, or Acaris, in natural hiſtory, an animalcule bred in wax; ſaid by Ariſtotle to be the leaſt object of human ſight.

ACARIA, a town of South America, in Paraguay, built by the Jeſuits, in 1624. Long. 23. 55. E. from Philadelphia. Lat. 26. S:

ACARNA, in botany, a name by which Theophraſtus, and ſome other writers, expreſs the common artichoak. Monſ. Vaillant gives the name of Acarna to one of the Cynarocephalous, or artichoak-headed claſs of plants.

ACARNAN, in ichthyology, the name of a ſmall ſea fiſh very common in the Mediterranean brought to market along the rubellios, or Erythrini, and called by the fiſhermen by the name, *ſavolino*, or *phragolino*. It very much reſembles the erythrinus in ſhape; but as that is of a fine red, this, on the contrary, is of a ſilvery white. Its mouth is moderately large; its teeth ſlender and pointed; and its eyes large, having fine yellow iriſes. Its fins are white; but have each a black ſpot at their origin. It ſeems doubtful whether this be really any way different from the erythrinus, except in colour, which is not a diſtinction ſufficient to make a ſpecies.

ACARNANIA, the firſt country of Free Greece, or Greece Proper, bounded on the weſt by the Sinus Ambracius, and ſeparated from Ætolia by the river Achelous from Epirus. The people were called *Acarnanes,* denoting perſons unſhorn; other Ætolians, to the eaſt of the Achelous, being called *Curetes,* by Homer, from being ſhorn. According to Lucian, they were noted for effeminacy and incontinance; hence the proverb, *Porcellus Acarnanes.* It is now called *la Carnia* and *Deſpotato.*

ACARNAR, a bright fixed ſtar, of the firſt magnitude, in Eridanus

ACARON, or Accaron, a town of Paleſtine, called *Ekron* in ſcripture. It was the boundary of the Philiſtines to the north; ſtood at ſome diſtance from the ſea, near Bethſhemeſh; and was famous for the idol of Baalzebub.

ACARUS, the Tick, or Mite, a genus of inſects belonging to the order of Apetera, or ſuch as have no wings. The acarus has eight legs; two eyes, one on each ſide of the head; and two jointed tentacula. The female is oviparous. Linnæus enumerates 35 ſpecies; of which ſome are inhabitants of the earth, ſome of the water; ſome live on trees, others among ſtones, and others on the bodies of other animals, and even under the ſkin. The deſcription of a few of the moſt remarkable will here ſuffice.

1. The firo, or cheeſe mite, is a very minute ſpecies. To the naked eye theſe mites appear like moving particles of duſt; but the microſcope diſcovers them to be perfect animals, having as regular a figure, and peforming all the functions of life as perfectly, as creatures that exceed them a million of times in bulk. The principal parts of them are the head, the neck, and the body. The head is ſmall in proportion to the body; and has a ſharp ſnout, and a mouth that opens and ſhuts like a mole's. They have two ſmall eyes, and are extremely quick ſighted; and when they have been once touched with a pin, one will eaſily perceive how cunningly they avoid a ſecond touch. Their legs are each furniſhed at the extremity with two little claws, with which the animal very nicely takes hold of any thing. The hinder part of the body is plump and bulky; and ends in an oval form, from which there iſſue out a few exceeding long hairs. The males and females are eaſily diſtinguiſhed in theſe little animals. The females are oviparous, as the louſe and ſpider; and from their eggs the young ones are hatched in their proper form, without having any change to undergo afterwards. They are, however, when firſt hatched, extremely minute; and, in growing to their full ſize, they caſt their ſkins ſeveral times. Theſe little creatures may be kept alive many months between two concave glaſſes, and applied to the microſcope. They are often ſeen *in coitu,* conjoined tail to tail; and this is performed by an incredibly ſwift motion. Their eggs, in warm weather, hatch in 12 or 14 days; but in winter not ſo ſoon. Theſe eggs are ſo ſmall, that 90 millions of them are not ſo large as a pigion's egg. They are very voracious animals, and have often been ſeen to eat one another. Their manner of eating is by thruſting alternately one jaw forward and the other backward, and in this manner grinding their food:

and after they have done feeding, they ſeem to chew the cud.—There are ſeveral varieties of this ſpecies found in different ſubſtances beſide cheeſe ; as in malt duſt, flour, oat meal, &c. Thoſe in malt duſt and oat meal are much nimbler than the cheeſe mites, and have more and longer hairs. There are alſo a ſort of wandering mites, which range wherever there is any thing they can feed on : They are often ſeen in the form of a white duſt, and are not ſuſpected to be living creatures. The mite is an animal very tenacious of life, and will live ſeveral months without food. Mr. Lewenhoek had one which lived 11 weeks, on the point of a pin, on which he had fixed it for examination by his microſcope.

2. Acarus Sanguisugus, or blood-ſucker. The hinder part of the abdomen is crenated, the ſcutellum is oval and yellowiſh, and the beak is trifid. It is a native of America, and ſticks ſo faſt to the legs of travellers, ſucking their blood, that it can hardly be extracted.

3. Acarus Telarius, is of a greeniſh yellow colour. It has a ſmall ſting, with which it wounds the leaves of plants, and occaſions them to fold backward. They are frequently to be met with in autumn, incloſed in the folded leaves of the lime tree.

4. Acarus Exulcerans, or the itch mite, is a very ſmall ſpecies : its body is of a figure approaching to oval, and lobated ; the head is ſmall and pointed ; its colour is whitiſh, but it has two duſky ſemicircular lines on the back. It has long briſtly legs; but the two firſt are ſhorter. It is found in the *puſtules* of the itch : authors in general have ſuppoſed that it cauſes that diſeaſe : but others obſerve, that if this were ſo, it would be found more univerſally in thoſe puſtules. It is more probable that theſe only make a proper nidus for it. See however the article Itch.

5. Acarus Ovinus, or ſheep tick, has a flat body, of a roundiſh figure, but ſomewhat approaching to oval, and of a yellowiſh white colour ; it has a ſingle large round ſpot on the back ; the anus is viſible in the lower part of the body ; the thorax is ſcarce conſpicuous ; the head is very ſmall and black ; the mouth is bifid ; the antennæ are of a calvated figure, and of the length of the ſnout ; the legs are ſhort and black. It is common on ſheep, and its excrements ſtain the wool green : it will live in the wool many months after it is ſhorn from the animal.

6. Acarus Coleoptratorum, or the acarus of inſects, is extremely minute : its body is round, reddiſh, and covered with a firm hard ſkin ; the head is very ſmall, the neck ſcarce viſible ; the legs are moderately long, the anterior pair longer than the others ; it has a whiteneſs about the anus. It is frequent on the bodies of many inſects, which it infeſts, as the louſe does others ; it runs very ſwiftly : the humble-bee and many others of the larger inſects, are continually infeſted with it ; but none ſo much as the common black beetle, which has thence been called the louſy beetle.

7. Acarus Baccarum, the ſcarlet tree or berry mite, is a ſmall ſpecies ; its body is roundiſh, and the back not at all flatted, as it is in many others ; the ſkin is ſmooth, ſhining and gloſſy ; and the whole animal ſeems diſtended and ready to burſt : the colour is a bright red, but a little duſkier on the ſides than elſewhere : the head is very ſmall, and the legs ſhort ; there is on each ſide a ſmall duſky ſpot near the thorax, and a few hairs grow from different parts of the body. It is very common on fruits, particularly on currants, on which we frequently ſee it running.

8. Acarus Longicornis, the red ſtone acarus or long horned mite, is very ſmall, and of a bright red colour ; the body is round, and diſtended ; the head is very ſmall and pointed ; the legs are moderately long, and of a paler red than the body : the antennæ are much longer than in any other ſpecies. It is frequent about old ſtone walls and on rocks, and runs very nimbly.

9. Acarius Aquaticus, or the water mite, is of a figure approaching to an oval, and the back appears depreſſed ; it is of a bright ſcarlet colour. The head is ſmall ; the legs are moderately long and firm, and are of a paler red than the body. It is common in ſhallow waters, where it runs very ſwiftly along the bottom. Its diminutiveneſs hinders the beauty of its colours from being perceived, as they are not diſcernible without the microſcope.

10. Acarus Holosericeus, is a ſmall ſpecies : its body is roundiſh, but a little approaching to oval ; the back ſomewhat depreſſed ; of a fine ſcarlet colour, and covered with a velvet-like down. The head and the eyes, which are two, are very ſmall ; the legs are ſhort and of a paler red, and there is a ſmall black-ſpot near the inſertion of the anterior ones. It is very common under the ſurface of the earth, and ſometimes on herbs and among hay. It is ſuppoſed to be poiſonous if ſwallowed ; but we have no certain account of ſuch an effect.

11. Acarus Longipes, the long-legged mite, is the largeſt of the genus. Its body is roundiſh, a duſky brown on the back, with a darker ſpot of a rhomboidal figure near the middle of it ; the belly is whitiſh ; the legs are extremely long and ſlender. On the back part of the head there ſtands a little eminence, which has on it a kind of double creſt, formed as it were of a number of minute ſpines : the two eyes are ſmall and black. It is very common in our paſtures towards the end of ſummer. Ray and Liſter call it *araneus cruſtatus longipes ;* Mouffet, *araneus longipes :* and, notwithſtanding its having but two eyes, it has been almoſt univerſally ranked among the ſpiders.

ACASABASTIAN, a river in the province of Vera Par, in Mexico. It has its ſource not far from the South Sea, and falls into the Golfo Dulce. Situated upon its banks, is a town of the ſame name.

ACASATHULA, a ſea-port, in the province of Guatimala Proper, in Mexico, ſituated on a point of land, about four leagues diſtant from the iſland of Trinidad. It lies in about 10° North latitude, and 15° Eaſt longitude from Philadelphia, and has three volcanoes in its neighbourhood.

ACATULUS, a juniper berry.

ACATASTATOS, inconſtant, is a phyſical term, applied to irregular fevers, whoſe paroxyſms are uncertain, and which are indicated by frequent changes in the urine. It is likewiſe applied to thoſe ſhivering fits in fevers, which have no conſtant return, and to turbid urine that depoſits no regular ſediment.

ACATHARSIA, in medicine, an impurity in the blood or humours.

ACATIUM, in ancient navigation, a kind of boat or pinnace uſed for military purpoſes. The acatium was a ſpecies of veſſels called *actuariæ naves*, i. e. ſuch as were wrought with oars. It was ſome times made uſe of in battle : Strabo repreſents it as a kind of privateer, or pirate ſloop.

ACAULIS, in botany, a term applied to certain plants, the flowers of which have no pedicle or ſtalk to ſupport them, but reſt immediately on the ground, ſuch as the carline thiſtle, &c.

ACAULOSE, or ACAULOUS, is applied by botaniſts, to thoſe plants, which have no proper *caulis*, or ſtem.

ACBAB, in natural hiſtory, a bird of the Philippine iſlands very like our common hen, which is often wild. It lives on rice, and other vegetables, and does a great deal of miſchief; but is ſhort-winded, and does not fly well, ſo that it is eaſily taken.

ACBARABAD, the capital of a province of Indoſtan, ſo named from the emperor Acbar. It is the largeſt city in the Great Mogul's dominions. See AGRA.

ACCAPITARE, in law, the act of becoming vaſſal of a lord, or of yielding him homage and obedience. Hence,

ACCAPITUM, ſignifies the money paid by a vaſſal upon his admiſſion to a feu.

ACCAPITUM, in ancient law, was uſed alſo to expreſs the relief due to the chief lord. See RELIEF.

ACCEDAS AD CURIAM, in the Engliſh law, a writ lying, where a man has received, or fears, falſe judgment in an inferior court. It lies alſo for juſtice delayed, and is a ſpecies of the writ RECORDARE, *which see*.

ACCEDAS AD VICE-COMITEM is a writ directed to the coroner, commanding him to deliver a writ to the ſheriff, who having a *Pone* delivered to him, ſuppreſſes it.

To ACCEDE. To be added to, to come to; generally uſed in political accounts; as, another power has *acceded* to the treaty; that is, has become a party.

To ACCELERATE. 1. To make qnick, to haſten, to quicken motion; to give a continual impulſe to motion, ſo as perpetually to increaſe.

2. It is generally applied to matter, and uſed chiefly in philoſophical language; but it is ſometimes uſed on other occaſions.—Perhaps it may point out to a ſtudent now and then, what may employ the moſt uſeful labours of his thoughts, and *accelerate* his diligence in the moſt momentous enquiries. *Watts.*

ACCELERATION. 1. The act of quickening motion. The law of the *acceleration* of falling bodies, diſcovered firſt by Galileo, is, that the velocities acquired by falling, being as the time in which the body falls, the ſpaces through which it paſſes will be as the ſquares of the velocities, and the velocity and time taken together, as in a quadruplicate ratio of the ſpaces. 2. The ſtate of the body accelerated or quickened in its motion.—The degrees of *acceleration* of motion, the gravitation of the air, the exiſtence or non-exiſtence of empty ſpaces, eitheir coacervate or interſperſed, and many the like, have taken up the thoughts and times of men in diſputes concerning them. *Hale's Origin of Mankind.* 3. The act of haſtening.—Conſidering the languor enſuing that action in ſome, and the viſible *acceleration* it maketh of age in moſt, we cannot but think venery much abridgeth our days. *Brown.*

ACCELERATION, in mechanics, the increaſe of velocity in a moving body. Accelerated motion is that which continually receives freſh acceſſions of velocity. Acceleration ſtands directly oppoſed to *retardation*, which denotes a diminution of velocity.

ACCELERATION, in phyſics, is chiefly uſed in reſpect of bodies, *i. e.* of heavy bodies tending towards the centre of the earth by the force of gravity. That natural bodies are accelerated in their deſcent, is evident from various conſiderations both *a priori* and *poſteriori*.—Thus, we actually find, that the greater height a body falls from, the greater impreſſion it makes, and the more vehemently does it ſtrike the ſubject plane, or other obſtacle. Various were the ſyſtems adopted by philoſophers, to account for this acceleration. But the immediate cauſe of acceleration is now ſufficiently known; the principle of gravitation, which determines the body to deſcend, determining it to be accelerated by a neceſſary conſequence. Suppoſe a body let fall from on high: the primary cauſe of its beginning to deſcend is doubtleſs the power of gravity; but when once the deſcent is commenced, the ſtate becomes in ſome meaſure natural to the body; ſo that, if left to itſelf, it would perſevere in it for ever, even though the firſt cauſe ſhould ceaſe: as we ſee in a ſtone caſt with the hand, which continues to move after it is left by the cauſe that gave it motion. But beſides the propenſity to deſcend impreſſed by the firſt cauſe, and which of itſelf would be ſufficient to continue the ſame degree of motion, once begun, *in infinitum*; there is a conſtant acceſſion of ſubſequent efforts of the ſame principle, gravity, which continues to act on the body already in motion, in the ſame manner as if it were at reſt. Here, then, being a double cauſe of motion; and both acting in the ſame direction, viz. directly towards the centre of the earth; the motion they jointly produce muſt neceſſarily be greater than that of any one of them. And the velocity thus increaſed having the ſame cauſe of increaſe ſtill perſiſting, the deſcent muſt neceſſarily be continually accelerated. The motion of a body aſcending, or impelled upwards, is diminiſhed by the principle of gravity acting in a contrary direction, in the ſame manner as a falling body is accelerated: See RETARDATION. A body thus projected upwards, riſes till it has loſt all its motion; which it does in the ſame time that a body falling would have acquired a velocity equal to that wherewith the body was thrown up. Hence the ſame body thrown up, will riſe to the ſame height, from which, falling, it would have acquired the velocity wherewith it was thrown up: And hence the heights, which bodies thrown up with different velocities do aſcend to, are to one another as the ſquares of thoſe velocities.

ACCELERATION OF BODIES ON INCLINED PLANES. The ſame general law obtains here as in bodies falling perpendicularly; the effect of the plane is to make the motion ſlower; but the inclination being every where equal, the retardation ariſing therefrom will proceed equally in all parts, at the beginning or ending of the motion. See MECHANICS.

ACCELERATION OF THE MOTION OF COMPRESSED BODIES, in expanding and reſtoring themſelves. That the motion of compreſſed air, expanding itſelf by its elaſticity to its former dimenſions, is accelerated, is evident from various conſiderations. See DILATATION.

ACCELERATION OF THE MOTION OF PENDULUMS.—The motion of pendulous bodies is accelerated in their deſcent; but in a leſs ratio than that of bodies falling perpendicularly. See MECHANICS and PENDULUM.

ACCELERATION OF THE MOTION OF PROJECTILES.—See PROJECTILE.

ACCELERATION OF THE FIXED STARS, in the ancient aſtronomy was the difference between the revolution of the *primum mobile* and the ſolar revolution; which was computed at three minutes and 56 ſeconds.

ACCELERATION OF THE MOON is a term uſed to expreſs the increaſe of the moon's mean motion from the ſun, compared with the diurnal motion of the earth: ſo that it is now a little ſwifter than formerly. Dr. Halley was the firſt who made this diſcovery; and he was led to it by comparing the ancient eclipſes obſerved at Babylon, with thoſe obſerved by Albatennius, in the ninth century, and ſome of his own time. He was not able to aſcertain the quantity of this acceleration becauſe the longitudes of Bagdad, Alexandria and Aleppo, where the obſervations were made, had not been accurately determined. But ſince his time, the longitude of Alexandria has been aſcertained by Chazelles; and Babylon, according to Ptolemy's account, lies 50 minutes eaſt from Alexandria. From theſe *data*, Mr. Dunthorne compared ſeveral ancient and modern eclipſes, with the calculations of them, by his own tables, and hereby verrified Dr. Halley's opinion; for he found that the ſame tables repreſent the moon's place more backward, than her true place in ancient eclipſes, and more forward than her true place in later eclipſes; and thence juſtly inferred, that the motion in ancient times was ſlower; in later times quicker, than the tables give it. But he did not content himſelf with merely aſcertaining the fact; he proceeded to determine the quantity of the acceleration; and by means of the moſt ancient eclipſe of which any authentic account remains, obſerved at Babylon, A. A. C. 721, he concluded, that the obſerved beginning of this eclipſe was not above an hour and three quarters before the beginning by the tables; and therefore the moon's true place could precede her place by computation, little more than 50 minutes of a degree at that time. Admitting the acceleration to be uniform, and the aggregate of it as the ſquare of the time, it will be at the rate of about 10 minutes in 100 years. Dr. Long attributes the acceleration above deſcribed to one or more of theſe cauſes: either, 1. The annual and diurnal motion of the earth continuing the ſame, the moon is really carried round the earth with greater velocity than heretofore: or, 2. The diurnal motion of the earth, and the periodical revolution of the moon continuing the ſame, the annual motion of the earth round the ſun is a little retarded; which makes the ſun's apparent motion in the ecliptic a little ſlower than formerly; and, conſequently, the moon in paſſing from any conjunction with the ſun, ſpends leſs time before ſhe again overtakes the ſun, and forms a ſubſequent conjunction: in both theſe caſes, the motion of the moon from the ſun is really accelerated, and the ſynodical month actually ſhortened. Or, 3. The annual motion of the earth, and the periodical revolution of the moon continuing the ſame, the rotation of the earth round its axis is a little retarded: in this caſe, days, hours, minutes, ſeconds, &c. by which all periods of time muſt be meaſured, are of a longer duration; and conſequently the ſynodical month will appear to be ſhortened, though it really contains the ſame quantity of abſolute time as it always did. If the quantity of matter in the body of the ſun be leſſened by the particles of light continually ſtreaming from it, the motion of the earth round the ſun may become ſlower: if the earth encreaſes in bulk, the motion of the moon round the earth may be quickened thereby. See ASTRONOMY.

ACCERERATOR, in anatomy, the name of two muſcles of the penis, which ſerve for ejecting the urine or ſemen. See ANATOMY, *Table of the Muſcles*.

To **ACCEND.** To kindle; to ſet on fire; a word very rarely uſed.

ACCENDED, lighted, or ſet on fire.

ACCENSI, in the Roman armies, ſupernumerary ſoldiers, deſigned to ſupply the places of thoſe who ſhould be killed or diſabled. They were thus denominated, *quia accenſebantar*, or *ad cenſum abjiciebantur*. Vegetius calls them *ſupernumerarii legionum*. Cato ſtiles them *ferentarii*, becauſe they furniſhed thoſe engaged in battle with weapons, drink, &c. though Nonnius ſuggeſts another reaſon of that appellation, viz. becauſe they fought with ſtones, ſlings, and weapons *quæ ferruntur*, ſuch as are thrown, not carried in the hand. They were ſometimes alſo called *velites*, and *velati*, becauſe they fought clothed, but not in armour; ſometimes *adſcripticii*, and *adſcriptivi*; ſometimes *rorarii*. The *accenſi*, Livy obſerves, were placed at the rear of the army, becauſe little was expected from them: they were taken out of the fifth claſs of citizens.

ACCENSION. The act of kindling, or the ſtate of being kindled.

ACCENT. 1. The manner of ſpeaking or pronouncing, with regard either to force or elegance. 2. In grammar, the marks made upon ſyllables, to regulate their pronunciation. 3. Poetically, language or words. 4. A modification of the voice, expreſſive of the paſſions or ſentiments.

ACCENT, in reading or ſpeaking, an inflection of the voice, which gives to each ſyllable of a word its due pitch, in reſpect of height or lowneſs. See READING.

ACCENT, in compoſition. See POETRY, Part III.

ACCENT, among grammarians, is a certain mark or character placed over a ſyllable, to direct the ſtreſs of its pronunciation. We generally reckon three grammatical accents in ordinary uſe, all borrowed from the Greeks, viz. the *acute accent* (´), which ſhows when the tone of the voice is to be raiſed. The *grave accent* (ˋ), when the note or tone of the voice is to be depreſſed. The *circumflex accent* (ˆ), is compoſed of both the acute and the grave, and points out a kind of undulation of the voice. The Latins have made the ſame uſe of theſe three accents.

ACCENTS, among the Hebrews, have a grammatical, a rhetorical, and muſical effect: though the firſt and laſt ſeem, indeed, to be the ſame; both being compriſed under the general name of *tonic accents*, becauſe they give the proper tone to ſyllables; as the rhetorical accents are ſaid to be euphonic, becauſe they tend to make the pronunciation more ſweet and agreeable. There are four euphonic accents, and 25 tonic; of which ſome are placed above, and others below the ſyllables; the Hebrew accents ſerving not only to regulate the riſings and fallings of the voice, but alſo to diſtinguiſh the ſections, periods, and numbers of periods, in a diſcourſe; and to anſwer the ſame purpoſes with the points in other languages. Their accents are divided into *emperors*, *kings*, *dukes*, *&c.* each bearing a title anſwerable to the importance of the diſtinction it makes. Their emperor rules over a whole phraſe, and terminates the ſenſe completely; anſwering to our point. Their king anſwers to our colon; and their duke to our comma. The king, however, occaſionally becomes a duke, and the duke a king, as the phraſes are more or leſs ſhort. The management and combination of theſe accents differ in Hebrew poetry from what they are in proſe. The uſe of the tonic or grammatical accents has been much controverted; ſome holding that they diſtinguiſh the ſenſe; while others maintain that they are only intended to regulate the muſic, or ſinging; alledging that the Jews ſing, rather than read, the ſcriptures in their ſynagogues. Be this as it will, it is certain the ancient Hebrews were not acquainted with theſe accents. The opinion which prevails among the learned, is, that they were invented about the ſixth century, by the Jewiſh doctors of the ſchool of Tiberias, called the *Maſſoretes.*

Accents, among the Greeks, now ſeen both in manuſcripts and printed books, have occaſioned no leſs diſpute about their antiquity and uſe, than thoſe of the Hebrews. Iſaac Voſſius endeavours to prove them of modern invention; aſſerting, that anciently they had nothing of this kind, but only a few notes in their poetry, which were invented by Ariſtophanes, the grammarian, about the time of Ptolemy Philopater; and that theſe were of muſical, rather than grammatical uſe, ſerving as aids in the ſinging of their poems, and very different from thoſe introduced afterwards. He alſo ſhows from ſeveral ancient grammarians, that the manner of writing the Greek accents, in thoſe days, was quite different from that which appears in our books. The author of *La Methode Greque,* obſerves, that the right pronunciation of the Greek language being natural to the Greeks, it was needleſs to mark it by accents in their writings: ſo that, according to all appearance, they only began to make uſe of them ſo late as the time in which the Romans, being curious to learn the Greek tongue, ſent their children to ſtudy at Athens, thinking thereby to fix the pronunciation, and to facilitate it to ſtrangers; which happened, as the ſame author obſerves, a little before Cicero's time. Wetſtein, Greek profeſſor at Baſil, in a learned diſſertation, endeavours to prove the Greek accents of an older ſtanding. He owns that they were not always formed in the ſame manner by the ancients; but thinks that difference owing to the different pronunciation which obtained in different parts of Greece. He brings ſeveral reaſons *à priori,* for the uſe of accents, even in the earlieſt days: as, that they then wrote all in capital letters equidiſtant from each other, without any diſtinction either of words or phraſes, which without accents could ſcarce be intelligible: and that accents were neceſſary to diſtinguiſh ambiguous words, and to point out their proper meaning; which he confirms from a diſpute on a paſſage in Homer, mentioned by Ariſtotle in his *Poëtics,* chap. v. Accordingly, he obſerves, that the Syrians, who have tonic, but no diſtinctive accents, have yet invented certain points, placed either below or above the words, to ſhow their mood, tenſe, perſon, or ſenſe.

Accents to prevent ambiguities, are ſucceſsfully uſed in ſome eaſtern languages, particularly the Siameſe and Chineſe. Among the people of China, every word or (which is the ſame thing) ſyllable, admits of five accents, as ſpoken more acutely or remiſsly; and thus ſtands for many different things. The ſame ſound *ya,* according to the accent affixed to it, ſignifies *God,* a *wall, excellent, ſtupidity,* and a *gooſe.* The Chineſe have but 330 ſpoken words in their language; but theſe being multiplied by the different accents or tones, which affect the vowels, furniſh a language tolerably copious. By means hereof, their 330 ſimple ſounds come to denote 1650 things; but this being hardly ſufficient, they are increaſed further by aſpirates added to each word to double the number. The Chineſe only reckon four *accents:* for which the miſſionaries uſe the following marks, *aā, á, à, ä.* They make a kind of modulation; wherein, by prolonging the duration of the ſound of the vowel, they vary the tone, raiſing and ſinking it to a certain pitch of voice: ſo that their manner of talking is a ſort of muſic or ſinging. Attempts have been made to determine the quantity of the riſe or fall in each accent by means of muſical notes: but this is hard to effect, as being different in different perſons. Hence the great difficulty of the language to foreigners; they are forced to ſing moſt ſcrupulouſly: if they deviate ever ſo little from the accent, they ſay quite a different thing from what was intended. Thus, meaning to compliment the perſon you are talking to with the title *Sir,* you call him *a beaſt* with the ſame word, only a little varied in the tone. Magalhon makes the language the eaſier to learn on this account.—The Siameſe are alſo obſerved to ſing rather than talk. Their alphabet begins with ſix characters, all only equivalent to a K, but differently accented. For though in the pronunciation the accents are naturally on the vowels, yet they have to diverſify ſuch of their conſonants as are in other reſpects the ſame.

Accent, in muſic, is a certain enforcement of particular ſounds, whether by the voice or inſtruments, generally uſed at the beginning of bars.

The Accents of Sentences ſeem to have been almoſt totally overlooked, while thoſe of words have been ſtudied moſt minutely. It is indeed remarkable, that all mankind ſeem to agree in lowering the voice at the end of a period, and elevating it in interrogations, and the like. See *Baron de Aug. Scient.* vi. 1. and Elem. Crit. ii.

To Accent, to pronounce; to ſpeak words with particular regard to the grammatical marks or rules.

ACCENTOR, he that ſings the leading part in a choir.

To ACCENTUATE, to place the proper accents over the vowels.

ACCENTUATION, 1. The act of placing the accent in pronunciation.—2. Marking the accent in writing.

To ACCEPT, to take with pleaſure; to receive kindly; to admit with approbation.

ACCEPTABILITY, the quality of being acceptable. See Acceptable.

ACCEPTABLE, that which is likely to be accepted; grateful; pleaſing.

ACCEPTABLY, in an acceptable manner; ſo as to pleaſe: with the particle *to.*

ACCEPTANCE, 1. Reception with approbation.—2. The meaning of a word as it is received or underſtood; *acceptation* is the word now commonly uſed.

Acceptance, in commerce, is the ſubſcribing, ſigning, and making one's ſelf debtor for the ſum contained in a bill of exchange or other obligation.

Acceptance, in law, the receiving of a rent, whereby the giver binds himſelf, for ever, to allow a former act done by another, wherher it be in itſelf good or not.

Acceptance, in the church of Rome, is put for receiving the pope's conſtitution.

ACCEPTATION, 1. Reception, whether good or bad.

But this large ſenſe ſeems now wholly out of uſe. 2. Good reception, acceptance. 3. The ſtate of being acceptable; regard. 4. Acceptance in the judicial ſenſe. This ſenſe occurs rarely. 5. The meaning of a word, as it is commonly received.

ACCEPTER, the perſon who accepts.

ACCEPTILATION, a term of the civil law, importing the remiſſion of a debt by an acquittance from the creditor, teſtifying the receipt of money, which has never been paid.

ACCEPTOR, in commerce, the perſon who accepts a bill.

ACCESS, 1. The way by which any thing may be approached. 2. The means, or liberty, of approaching either to things or men. 3. Encreaſe, enlargement, addition.

ACCESSARY, that which, without being the chief conſtituent of a crime, contributes to it.

ACCESSIBLE, that which may be approached; that which we may reach or arrive at. It is applied both to perſons and things, with the particle *to*.

ACCESSION, 1. Encreaſed by ſomething added, enlargement, augmentation. 2. The act of coming to, or joining one's ſelf to; as, *acceſſion* to a confederacy. 3. The act of arriving at; as, the king's *acceſſion* to the throne.

Accession, in law, is a method of acquiring property, by which, in things that have a cloſe connection of dependance upon one another, the property of the principal thing draws after it the property of the acceſſory. Thus, the owner of a cow becomes likewiſe the owner of the calf. It ſometimes likewiſe ſignifies conſent or acquieſcence.

Accession, in medicine, denotes a fit, or return of ſome periodical diſeaſe. We ſay an acceſſion of the gout, but eſpecially of an ague, an intermitting fever, an epilepſy, &c. an acceſſion of madneſs; ſometimes alſo a prophetical acceſſion, a cold acceſſion, &c. Acceſſion is frequently confounded with paroxyſm: but they are different; an acceſſion being the beginning of a diſeaſe, a paroxyſm the height of it.

ACCESSOR, a comer to. *Bailey.*

ACCESSORILY, in the manner of an acceſſory.

ACCESSORY, joined to another thing, ſo as to increaſe it; additional.

Accessory, 1. Applied to perſons.—A man who is guilty of a felonious offence, not principally, but by participation; as, by commandment, advice or concealment. And a man may be *acceſſory* to the offence of another, after two ſorts, by the common law, or by ſtatute: and, by the common law, two ways alſo; that is, before or after the fact. Before the fact; as, when one commandeth or adviſeth another to commit a felony, and is not preſent at the execution thereof; for his preſence makes him alſo a principal; wherefore there cannot be an *acceſſory* before the fact in manſlaughter; becauſe manſlaughter is ſudden and not prepenſed. *Acceſſory*, after the fact, is when one receiveth him, whom he knoweth to have committed a felony.

An Accessory in felony ſhall have judgment of life and member, as well as the principal who did the felony; but not till the principal be firſt attainted, and convicted, or outlawed thereon. When the principal is pardoned without attainder, the acceſſory cannot be arraigned; it being a a maxim in law, *Ubi non eſt principalis, non poteſt eſſe acceſſorius;* where there is no principal, there can be no acceſſory. In the loweſt and higheſt offences there are no acceſſories, but all are principals; as in riots, routs, forcible entries, and other treſpaſſes, which are the loweſt offences. So alſo in the higheſt offence, which is high treaſon, there are no acceſſories. Acceſſories, in petty treaſon, murder, and in felonies of ſeveral kinds, are not to have the benefit of clergy.

Accessory Nerves, Accessory or Par Accessorium Willisii, ſo called from Dr. Willis, the diſcoverer, in anatomy, a pair of nerves, which, ariſing from the medulla in the vertebræ of the neck, aſcend, and enter the ſkull, and paſs out of it again with the par vagum, wrapped up in the ſame common integument; and after quitting them, are diſtributed into the muſcles of the neck and ſhoulders. See Anatomy.

Accessory, among painters, an epithet given to ſuch parts of a hiſtory piece as ſerve chiefly for ornament, and might have been wholly left out: ſuch as vaſes, armour, &c.

ACCHO, a city of Galilee, on the coaſt of the Mediterranean, which formerly belonged to the tribe of Aſher. It was ſituated 32 miles S. of Tire, and was ſurrounded by the mountains of Galilee on the E. and Carmal on the S. It was rebuilt by Polemy Philadelphus, and called Ptolemais.

ACCI, in ancient geography, a town of Tarraconenſis, formerly called *Acti;* ſuppoſed to be *Guadix*, to the eaſt of the city of Granada, at the foot of a mountain, near the ſource of the rivulet Guadalantin, now greatly decayed. It is the Colonia Accitana Gemella, and was of ſome repute among the Roman colonies. The people were called Gemellenſes, becauſe the colony conſiſted of coloniſts from the third and ſixth legions.

ACCIDENCE, the little book containing the firſt rudiments of grammar, and explaining the properties of the eight parts of ſpeech.

ACCIDENS, in philoſophy, is frequently uſed among philoſophers, to denote what does not follow from the nature of a thing, but from ſome accidental qualities thereof; in which ſenſe it ſtands oppoſed to *per ſe*, which denotes the nature and eſſence of a thing. Thus fire is ſaid to burn *per ſe*, or conſidered as fire, and not *per accidens;* but a piece of iron, though red hot, only burns *per accidens*, by a quality accidental to it, and not conſidered as iron. See Accident.

ACCIDENT, 1. The property or quality of any being, which may be ſeparated from it, at leaſt in thought. 2. In grammar, the property of a word. 3. That which happens unforeſeen; caſualty, chance.

Accident, among logicians, is uſed in a three fold ſenſe. 1. Whatever does not eſſentially belong to a thing; as the clothes a man wears, or the money in his pocket. 2. Such properties in any ſubject as are not eſſential to it; thus, whiteneſs in paper is an accidental quality. 3. In oppoſition to ſubſtance, all qualities whatever are called accidents; as ſweetneſs, ſoftneſs, &c.

Accident, in grammer, implies a property attached to a word, without entering into its eſſential definition; for every word, notwithſtanding its ſignification, muſt be either primitive, derivative, ſimple, or compound, which are the accidents of words. A word is ſaid to be primative when, it is taken from no other word in the language in which it is uſed: thus *heaven*, *king*, *good*, are primative words. It is ſaid to be derivative, when it is taken from ſome other word: thus *heavenly*, *kingdom*, *goodness*, &c. are derivatives. A ſimple word is eaſily diſtinguiſhed from a compound: thus *just*, *justice*, are ſimple words; *unjust*, *injustice*, are compound: *res* is a ſimple word, as well as *publica*; but *respublica* is a compound. Beſides theſe accidents, which are common to all ſorts of words, each particular ſpecies has its accidents: thus the accidents of the noun ſubſtantive are the gender, declenſion, and number; and the adjective has another accident, namely, the compariſon. See the articles Grammar and Language.

Accident, in philoſophy, ſomething ſuperadded to a ſubſtance, not eſſentially belonging to it, but capable of being, or not being in it, without affecting its exiſtence.

Accident, among phyſicians, is ſometimes uſed for what is more generally called ſymptom.

ACCIDENTS, in aſtrology, denote the moſt extraordinary occurrences in the courſe of a man's life; ſuch as, a remarkable inſtance of good fortune, a ſignal deliverance, a great ſickneſs, &c.

ACCIDENTAL. A property non-eſſential.

Accidental, 1. Having the quality of an accident, non-eſſential. 2. Caſual, fortuitous, happening by chance.

Accidental, in philoſophy, is applied to that effect which flows from ſome cauſe intervening by accident, without being ſubject, or at leaſt without any appearance of being ſubject, to general laws or regular returns. In this ſenſe, *accident* is oppoſed to *constant* and *principal*. Thus the ſun's place is, with reſpect to the earth, the conſtant and principal cauſe of the heat in ſummer and the cold in winter; whereas winds, ſnows and rains, are the accidental cauſes which often alter and modify the action of the principal cauſe.

Accidental Colours, in optics, are thoſe which depend upon the affections of the eye, in contradiſtinction to thoſe which belong to the light itſelf. The impreſſions made upon the eye, by looking ſteadfaſtly at a particular colour, are various, according to the ſingular colour, or combination of colours in the object: and they continue for ſome time after the eye is withdrawn, and give a falſe colouring to other objects. The Count de Buffoon has endeavoured to trace the connections, which theſe accidental colours have with ſuch as are natural, in a variety of inſtances. The ſubject has alſo been conſidered by De la Hire and M. Epences: and M. d'Acry has contrived a machine for determining the duration of the effects of light, and after ſeveral trials, finds that it continues about eight thirds of a minute.

Accidental Dignities and Debilities, in aſtrology, are certain caſual diſpoſitions, and affections of the planets, whereby they are ſuppoſed to be either ſtrengthened or weakened, by their being in ſuch a houſe of the figure.

Accidental Point, in reſpective, is that point in the horizontal line, where the projections of two lines parallel to each other meet the perſpective plane.

ACCIDENTALLY. 1. After an accidental manner; non-eſſentially. 2. Caſually, fortuitouſly.

ACCINCT. Girded.

ACCIPENSER, in ichthyology, a genus of fiſhes, belonging to the order of Nantes, and claſs of Amphibia, in the Linnæan ſyſtem. The accipenſer has a ſingle linear noſtril; the mouth is in the under part of the head, and contains no teeth; the cirri are below the ſnout, and before the mouth. There are three ſpecies of this genus, viz.

1. **Accipenser Huso** has four cirri; the body is naked, i. e. has no prickles or protuberances. The ſkin of the huſo is ſo tough and ſtrong, that it is employed to draw carts and other wheel carriages; and the ichthyocollo, or iſinglaſs of the ſhops, is made from its ſound and ſcales. The huſo is the largeſt of the genus, and grows to 24 feet in length. It inhabits the Danube and the rivers of Ruſſia.

2. **Accipenser Ruthenus** has four cirri, and 14 ſquamous protuberances. It is a native of Ruſſia.

3. **Accipenser Sturio**, or the ſturgeon, has four cirri, and eleven ſquamous protuberances on the back. His mouth has no teeth, and is placed under the head like the opening of a purſe, which he has the power to puſh ſuddenly out, or to retract. Before his mouth, under the beak or noſe, hang the four tendrils, or cirri, ſome inches long, which ſo much reſemble earth worms, as to be at firſt ſight eaſily miſtaken for them. This clumſy, toothleſs fiſh, is ſuppoſed by this contrivance, to keep him ſelf in good condition, the ſolidity of his fleſh evidently ſhewing him to be a fiſh of prey. He is ſaid to hide his large body among weeds, in rivers, only expoſing his cirri, which ſmall fiſh, or inſects, miſtaking for real worms, approach for plunder, and are ſucked into the jaws of their enemy.

The fiſh is found in the great rivers of Europe; but is caught in few of them, in ſo great numbers, as in thoſe of the United States. Vaſt quantities are taken in the Baltic and particularly during ſummer, in the lakes Friſchehaff and Curiſch-haff, near Pillau, where the adjacent ſhores are formed into diſtricts, and farmed out to companies of fiſhermen, ſome of which are rented for 3000 guilders, or about 1400 dollars per annum. It ſeems a heavy, ſpiritleſs fiſh, making no manner of reſiſtance, when entangled, but is drawn out of the water like a lifeleſs lump. It is ſeldom taken far out at ſea; but frequents ſuch parts as are not remote from the æſtuaries of great rivers. In moſt parts of Europe, it is admired for the delicacy and firmneſs of its fleſh, which is white as veal, and very good, when roaſted; and is ſo highly valued in London, that the firſt ſturgeon caught in the Thames is, according to cuſtom, annually preſented to the king, and the ſecond to the lord mayor: but in this country, it is held in little or no eſtimation. It is generally eſtemed beſt pickled, in which form, great quantities are exported from the Baltic, and from ſome of our American rivers. They are found in prodigious numbers during the warm months, in the Hudſon; and towards the head of that river, they are caught in ſo great quantities, that they can be had for almoſt nothing. In Albany, during the ſummer months, they are to be ſeen in ſo great numbers, that they are commonly denominated by the inhabitants of the ſtate of New-York, *Albany beef*. They likewiſe abound in the river Delaware; where, as well as in other places, they may be ſeen, during the warm weather, to leap ſome yards out of the water, and make a noiſe in their fall, which is heard at a great diſtance.

Thoſe caught in ſome of the European rivers are employed to various uſeful and lucrative purpoſes, beſides as an article of food. Caviare is made of the rows or ſpawn of this and the other ſorts of ſturgeon. The ſkin is converted into an excellent covering for carriages. Ichthyocollo, or iſingloſs is likewiſe made of the ſkin or ſound. We have not as yet heard of any attempt being made in the United States to manufacture this valuable article, though the fiſh is ſo plenty in our rivers, as to be nearly of no conſequence as an article of food. The ſturgeon grows to a great ſize: to the length of eighteen feet, and has been ſometimes found to weigh upwards of 500 pounds. In the manner of breeding this fiſh, it is an exception amongſt the cartilaginous kind, being like the bony fiſh, oviparous, ſpawning in water.

ACCIPESIUS, in ichthyology, a name given by Athenæus and others of the Greek writers, to the ſturgeon, called by others *oniſcos*, See ACCIPENSER, No. 3.

ACCIPIENT. A receiver, perhaps ſometimes uſed for *recipient*. *Dict.*

ACCIPITER, in ichthyology, a name given by Gellius, and ſome authors, to the fiſh called by others the *milvus* and *lucerna*. It is a ſpecies of the trigla, and is diſtinguiſhed by Artedi, by the name of the trigla, with the head a little aculeated, and with a ſingular fin, placed near the pectoral fins.

ACCIPITER, in tha Linnæan ſyſtem of zoology, the name of the firſt order of birds. See ZOOLOGY.

ACCIPITER, in Roman antiquity and ornithology, the hawk, which, from its carnivorous nature, and its frequenting fields of battle, they conſider as a bird of bad omen. Pliny, however, tells us, that in ſome caſes, particularly in marriage, it was eſteemed a bird of good omen, becauſe it never eats the hearts of other birds; intimating thereby, that no differences in the marriage ſtate ought to reach the heart. The accipiter was worſhipped as a divinity by the inhabitants of Tentyra, an iſland in the Nile, being conſidered by them as the image of the ſun; and hence we find that luminary repreſented, in hieroglyphics, under the figure of a hawk.

ACCIPITRINA, in botany, a name by which ſome authors have expreſſed the hawk-weed, and others the flixweed, or ſophia chirurgorum.

ACCIMUS denotes a feigned refuſal of ſomething which a perſon earneſtly deſires. The word is Latin, or rather Greek *akkiſmos* ſuppoſed to be formed from *Acco*, the name of a fooliſh old woman, famous in antiquity for an affectation of this kind. Acciſmus is ſometimes conſidered as a virtue, ſometimes as a vice, which Auguſtus and Tiberius practiſed with great ſucceſs. Cromwell's refuſal of the crown of Englahd may be brought as an inſtance of an acciſmus. It is uſed in rhetoric, as a ſpecies of irony.

ACCITUM, in ancient geography, a town of Hiſpania Battica, now *Finiana*, as appears from an ancient inſcription; ſituated on an eminence of the mountains Alpuxaras in Granada.

ACCIUS, the ſirname of a Patrician family, at Rome, the anceſtors of Azo, E. of Eſte, from whom the various princes of the Brunſwick family, and the illuſtrious houſe of Hanovor, are lineally deſcended.

ACCLAMATION, a ſhout of joy, by which the multitude expreſs their applauſe or approbation.

ACCLAMATION, in antiquity, denotes a certain form of words, uttered with extraordinary vehemence, and in a peculiar tone, frequent in the ancient aſſemblies. Acclamations were uſually accompanied with applauſes, with which they are ſometimes confounded: though they ought to be diſtinguiſhed; as *acclamation* was given by the voice, *applauſe* by the hands; acclamation was beſtowed on perſons abſent, applauſe only thoſe preſent. Acclamation was alſo given by women, whereas applauſe ſeems to have been confined to men. They were of various kinds; eccleſiaſtical, military, nuptial, ſenatorial, theatrical, &c. and they had not only acclamations of joy and reſpect, but even of reproach and contumely. Suetonius furniſhes an inſtance of this laſt kind in the Roman ſenate, on occaſion of the decree for aboliſhing the ſtatutes of Domitian, when the ſenators could not refrain from contumelious acclamations of the deceaſed.

On the theatres in the earlieſt ages of the Roman commonwealth, they were artleſs and little more than confuſed ſhouts. Afterwards they became a ſort of regular concerts. That mentioned by Phædrus, *lætare, incolumis Roma ſalvo principe!* i. e. Hail Rome, fortunate, in the ſafety of thy prince, which was made for Auguſtus, and proved the occaſion of a pleaſant miſtake of a flute-player called *princeps*, ſhows that muſicial acclamations were in uſe in that emperor's reign. Suetonius gives another inſtance in the time of Tiberius; a falſe report of Germanicus's recovery being ſpread through Rome, the people ran in crowds to the capitol with torches and victims, ſinging *Salva Roma! Salva Patria! Salvus eſt Gremanicus!* i. e. Hail Rome, hail our country, Germanicus is ſafe.—Nero, paſſionately fond of muſic, took ſpecial care to improve and perfect the muſic of acclamations. When he played on the theatre, Burrhus and Seneca, giving the ſignal by clapping, 5000 ſoldiers began to chant his praiſe, which the ſpectators were obliged to reapeat. The whole was conducted by a muſic-maſter. The honour of acclamations was chiefly rendered to emperors, their children, and favourites; and to the magiſtrates, who preſided at the games. Perſons of diſtinguiſhed merit alſo ſometimes received them, of which Quintillian gives us inſtances in Cato and Virgil. The moſt uſual forms were *Feliciter! Longiorem vitam! Annos felices!* i. e. Happineſs, long life, happy years.—The actors themſelves, and they who gained prizes in the games of the circus, were not excluded the honour of acclamations.—Military acclamations were thoſe of the ſoldiers and the people in time of triumph. The victorious army accompanied their general to the capital; and, among the verſes they ſang in his praiſe, frequently repeated TO TRIUMPHE, i. e. Huzza, triumph! which the people anſwered in the ſame ſtrain.

They alſo gave their general the title of *Imperator*, after ſome notable victory; a title which he only kept till his triumph was over. The acclamations of the ſenate were ſomewhat more ſerious, but aroſe from the ſame deſire of pleaſing the prince or his favourites; and aimed likewiſe at the ſame end, either to expreſs the general approbation and zeal of the ſenate, or to congratulate him on his victories, or to make him new proteſtations of fidelity. Theſe acclamations were uſually given after a report made by ſome ſenator, to which the reſt expreſſed their conſent crying OMNES! OMNES! i. e. All, all; or elſe, EQUUM EST! JUSTUM EST! i. e. It is juſt and right. Sometimes they began with acclamations, and ſometimes ended with them without any debate. It was in this manner that all the elections and proclamations of emperors made by the ſenate, were conducted; ſomething of which practice is ſtill retained in voluntary exclamations on public occaſions, as "Vive la Republique" amongſt the French, and "God ſave the King," amongſt the Engliſh. The Greeks borrowed the cuſtom of receiving their emperors in the public places from the Romans; and the Turks practiſe ſomething like this on the ſight of their emperors and grand viziers to this day. The form among the Jews was, Hoſannah. As for the acclamations wherewith authors, poets, &c. were received, who recited their works before the public, among the Romans; the aſſemblies were held with great parade in the capitol, temples, the Athenæum, or the houſes of great men. Invitations were ſent every where to get the greater appearance. Men of fortune, who pretended to wit, kept applauders in their ſervice, and ſent them to their friends. Others endeavoured to gain them by preſents and treats. Philoſtratus mentions one, who lent money to men of letters, and forgave the intereſt to ſuch as applauded his exerciſes. Theſe acclamations were conducted much after the ſame manner as thoſe on the theatre; but they were ſuited both to the ſubject and to the perſon. There were particular ones for philoſophers, for orators, for hiſtorians, and for poets. One of the moſt uſeful forms was *Sophos*, i. e. wiſe, repeated three times. Neither the Greeks nor Romans were barren on this head. The names of Gods and heroes were given thoſe whom they would extol; and the acclamations were renewed at every fine paſſage, frequently at every period. Thoſe wherewith they honoured the victories of the athletæ, were a natural conſequence of the impetuous motions which attended the gymnaſtic games. The acclamations of the people, ſometimes expreſſing their compaſſion and joy, ſometimes their horror and diſguſt, are ſtrongly painted by different poets and orators. Acclamations made alſo a part of the ceremony of marriage. They were uſed for the omen's ſake; being the *Læto Omina*, ſometimes ſpoken of before marriage in Roman writers. Acclamations alſo are frequent in our modern theatres: the French expreſs it by *bravo! bravissimo!* the Engliſh by clapping hands; which cuſtom likewiſe prevails in our theatres, the performers of both ſexes being moſtly Engliſh.

Acclamation Medals, among antiquaries, ſuch as repreſent the people expreſſing their joy in the poſture of acclamation.

ACCLIVITY, the ſteepneſs or ſlope of a line inclining to the horizon, reckoned upwards; as, the aſcent of a hill is the *acclivity*, the deſcent is the *declivity*.

ACCOMMODATION. 1. Proviſion of conveniences. 2. The plural, conveniencies, things requiſite to eaſe or refreſhment. 3. Adaption, fitneſs; with the particle *to*. 4. Compoſition of a difference, reconciliation, adjuſtment.

Accommodation, in philoſophy, the application of one thing by analogy, to another. To know a thing by accommodation, is to know it by the idea of a ſimilar thing referred thereto.

ACCOMPANIMENT, the adding of one thing to another by way of ornament.

Accompaniment, in muſic, denotes the inſtruments which accompany a voice, in order to ſuſtain it, as well as to make the muſic more full. The accompaniment is uſed in recitative as well as in ſong; on the ſtage, as well as in choir, &c. The ancients had likewiſe their accompaniments on the theatre; they had even different kinds of inſtruments to accompany the chorus, from thoſe which accompanied the actors in the recitation.—The accompaniment, among the moderns, is frequently a different part or melody from the ſong it accompanies. It is diſputed whether it was ſo among the ancients. It is generally alledged, that their accompaniments went no farther than the playing in actavo, or in antiphony to the voice. The Abbe Fraguier, from a paſſage in Plato, attempts to prove, that they had actual ſymphony, or muſic in parts: but his arguments ſeem far from being concluſive. The organiſts apply it to thoſe pipes which they occaſionally touch to accompany the treble.

Accompaniment, in painting, denotes ſuch objects as are added, either by way of ornament, or probability; as dogs, guns, game, &c. in a hunting piece.

To ACCOMPANY. 1. To be with another as a companion. It is uſed both of perſons and things. 2. To aſſociate with; to become a companion to.

ACCOMPLICE, an aſſociate, a partaker, uſually in an ill ſenſe. By the law of Scotland, the accomplice can only be proſecuted after the conviction of the principal offender: unleſs the acceſſion of the accomplice is immediate, in *ipso actu*, ſo as in effect to render them co-principal. By the general rule, the accomplice ſuffers the ſame puniſhment with the principal offender. Yet if he be remarkably leſs guilty, juſtice will not permit equal puniſhment. The council of Sens, and ſeveral other ſynodical ſtatutes, expreſsly prohibit the revealing accomplices. See Accessory.

To ACCOMPLISH. 1. To complete, to execute fully; as, to *accompliſh* a deſign. The complete execution or performance of ſomething to be done. 2. To complete a period of time.

Accomplishments, in theology, is principally uſed in ſpeaking of events foretold by the Jewiſh prophets in the Old Teſtament, and fulfilled under the new. We ſay a literal accompliſhment, a myſtical or ſpiritual accompliſhment, a ſingle accompliſhment, a double accompliſhment, a Jewiſh accompliſhment, a Chriſtian accompliſhment. The ſame prophecy is ſometimes accompliſhed in all, or in ſeveral of thoſe different ways. Thus, of ſome of the prophecies of the Old Teſtament, the Jews find a literal accompliſhment in their own hiſtory, about the time when the prophecy was given: the Chriſtians find another in Chriſt, or the earlieſt days of the church, &c. There are two principal ways of accompliſhing a prophecy; *directly*, and by *accommodation*. See Accommodation and Prophecy.

ACCOUNT, or Accompt, in a general ſenſe, a computation or reckoning of any thing by numbers. Collectively, it is uſed to expreſs the books which merchants, traders, bankers, &c. uſe for recording their tranſactions in buſineſs. See Book-keeping.

There are various ways of accounting; as by enumeration, or telling one by one; and by the rules of arethmetic, addition, ſubtraction, &c. See thoſe rules in the ſyſtem of Arithmatic.

We account time by years, months &c. The Greeks accounted

counted it by olypiads ; the Romans by indictions, luſtres, &c. We account diſtances by miles leagues, &c.

ACCOUNT is taken ſometimes in a particular ſenſe, for the computation of time. Thus we ſay, the Julian Account, the Gregorian Account, &c. in which ſenſe it is equivalent to ſtyle.

Books of **ACCOUNTS**, of merchants and tradeſmen, are conſidered as a ſort of private inſtruments ; and, in the civil law, and law of merchants, are allowed to make half proof. The reaſon is, that merchants are often under a neceſſity of dealing on truſt, without note or writing. Hence the ſuppletory oath of the merchant, with his book of accounts, is admitted abroad as a full proof againſt his chapman. But in England this is under ſome limitation. See ſtat. 7. Jac. I. cap. 12. which confines this ſpecies of proof to ſuch tranſactions as have happened within one year before the action brought, unleſs between merchant and merchant, in the uſual intercourſe of trade.

ACCOUNTANT, a computer ; a man ſkilled or employed in accounts.

ACCOUNTANT, or **ACCOMPTANT**, in commerce, is applied to a perſon, or officer, appointed to keep the accounts of a public company or office ; as the South-ſea, the India company, the Bank, the Exciſe, &c.

ACCOUNTANSHIP, the art of keeking and ballancing accounts. See BOOK-KEEPING.

ACCOUNTS, Chamber of, in the late French policy, was a ſovereign court of great antiquity, which took cogniſance of and regiſtered the accounts of the king's revenue. It was nearly the ſame with the Engliſh Court of Exchequer.

ACCOUTREMENT; dreſs, equipage, furniture relating to the perſon ; trappings, ornaments.

ACCRETION, in phyſics, the growth or increaſe of an organical body, by the acceſſion of new parts. Alſo a growing together, as of the fingers to one another. The word is compounded of *ad*, to, and *creſcere*, to grow. Accretion is of two kinds ; the one conſiſting in an external appoſition of new matter. This is what we otherwiſe call *juxtapoſition;* and it is thus ſtones, ſhells, &c. are ſuppoſed to grow. The other is by ſome fluid matter received into proper veſſels, and gradually brought to adhere or grow to the ſides thereof. This is what we call *introſuſception;* and it is thus that plants and animals are nouriſhed.

ACCUBATION, in antiquity, was the table poſture of the Greeks and Romans ; whence we find the word particularly uſed for the lying, or rather, as we call it, ſitting down to meat. The Greeks introduced this poſture. The Romans, during the frugal ages of the republic, were ſtrangers to it. But as luxury got footing, this poſture became adopted, at leaſt by the men ; for as to women, it was reputed an indecency in them to lie down among the men ; though afterwards this too was got over. But children did not lie down, nor ſervants, nor ſoldiers, nor perſons of meaner condition ; but took their meales ſitting, as a poſture leſs indulgent. The Roman manner of diſpoſing themſelves at table was this ; a low round table was placed in the cœnaculum, or dining-room, and about this uſually three, ſometimes only two beds, or couches ; according to the number of which it was called *biclinium*, or *triclinium*. Theſe were covered with a ſort of bed-clothes, richer or plainer, according to the quality of the perſon, and furniſhed with quilts and pillows, that the gueſts might lie more commodiouſly. There were ordinarily three perſons on each bed ; to croud more was eſteemed ſordid. In eating they lay down on their left ſides, with their heads reſting on their elbows. The firſt lay at the head of the bed, with his feet extended behind the back of the ſecond ; the ſecond lay with the back of his head towards the navel of the firſt, only ſeparated by a pillow, his feet behind the back of the third ; and ſo of the third, or fourth. The middle place was eſteemed the moſt honourable. Before they came to table, they changed their clothes, putting on what they called *cœnatoria veſtis*, the dining garment, and pulled off their ſhoes, to prevent ſoiling the bed.

ACCUBITOR, an ancient officer of the emperors of Conſtantinople whoſe buſineſs was to lie near the emperor, He was the head of the youth of the bed chamber, and had the cubicularis and procubitor under him.

ACCUMULATION, in ancient agriculture, the operation of covering up the roots of trees, by throwing on them the earth that had been before dug from them ; in which ſenſe, accumulation ſtands oppoſed to ABLAQUEATION ; which ſee.

ACCUMULATION OF DEGREES, in an Univerſity, is uſed for the taking of ſeveral degrees together, and with fewer exerciſes, or nearer to each other, than the ordinary rules allow of.

ACCUMULATION, in law, the concurrence of ſeveral titles to the ſame thing, or of ſeveral circumſtances to the ſame proof.

ACCUMULATOR, he that accumulates ; a gatherer or heaper together.

ACCURACY, exactneſs, nicety.

ACCURSED, in the Jewiſh idiom, was ſynonymous with hanged or crucified. Among them, every one was accounted accurſed who died on a tree. This ſerves to explain the difficult paſſage in Rom. ix. 3. where the apoſtle Paul wiſhes himſelf accurſed after the manner of Chriſt, i. e. crucified, if happily he might by ſuch a death ſave his countrymen.

ACCUSABLE ; that which may be cenſured ; blameable ; culpable.

ACCUSATIO, in medicine. See INDICATIO.

ACCUSATION ; 1. The act of accuſing. 2. The charge brought againſt any one by the accuſer.

ACCUSATION, the charging any perſon with a criminal action, either in one's own name, or in that of the public. It has formerly been the cuſtom, in ſome parts of Europe, where the accuſation was very heavy, either to decide by combat, or at leaſt to make the accuſed purge himſelf by oath ; which, however, was not admitted, excepting a certain number of his neighbours and acquaintances ſwore together with him.

Writers on politics treat of the benefit and the inconveniences of public accuſations. Various arguments are alledged, both for the encouragement and diſcouragement of accuſations againſt great men. Nothing, according to Machiavel, tends more to the preſervation of a ſtate, than frequent accuſations of perſons truſted with the adminiſtration of public affairs. This, accordingly, was ſtrictly obſerved by the Romans, in the inſtances of Camillus, accuſed of corruption by Manlius Capitolinus, &c. Accuſations, however, in the judgment of the ſame author, are not more beneficial than calumnies are pernicious; which is alſo confirmed by the practice of the Romans. Manlius not being able to make good his charge againſt Camillus, was caſt into priſon.

By the Roman law, there was no public accuſer for public crimes; every private perſon, whether intereſted in the crime or not, might accuſe, and proſecute the accuſed to puniſhment, or abſolution. Cato, the moſt innocent perſon of his age had been accuſed forty-two times, and as often abſolved. The accuſation of private crimes was never received but from the mouths of thoſe who were immediately intereſted in them; but the huſband could accuſe his wife of adultery.

By the Magna Charta of England it was declared "no man ſhall be impriſoned or condemned on any accuſation, without trial by his peers, or the law of the land; and no man ſhall be moleſted by petition to the king, &c. unleſs it be by indictment or preſentment of lawful men, or by proceſs at common law. Promoters of ſuggeſtion are to find ſurety to purſue them; and if they do not make them good, ſhall pay damages to the party accuſed, and alſo a fine to the king. No perſon is obliged to anſwer upon oath to a queſtion whereby he may accuſe himſelf of any crime." Subſequent laws, however, have altered this important charter to ſo great a degree, that there is ſcarcely a clauſe in it, which is not now countervailed by ſome ſubſequent law.

ACCUSATIVE, a term of grammar, ſignifying the relation of the noun, on which the action, implied in the verb, terminates.

Accusative, in Latin and Greek grammer, the 4th caſe of nouns, pronouns, and participles; ſo named, probably, from its being uſed, when an action paſſes *a cauſa ad aliquem vel aliquid*, from ſome active cauſe or agent, to ſome perſon or thing. Its uſe may be conceived from this, that all verbs which expreſs actions that paſs from the agent, as to beat, &c. muſt have ſubjects to receive thoſe actions; for, if I beat, I muſt beat ſomething; ſo that ſuch verb evidently requires after if a noun, or name, to be the object of the action expreſſed. Hence, in all languages, which have caſes, the nouns have a termination, which they call accuſative; as, *amo Deum*, I love God. Although the Engliſh language has properly no caſes, except the nominative, yet agreeably to gramatical rules, the noun that follows an active verb may be ſaid to be in the *accuſative*; for, as we place words in their natural order, the nominative conſtantly precedes, and the accuſative follows the verb.—Thus, when we ſay, the prince loves the princeſs, and the princeſs loves the prince: the prince is the nominative in the firſt, and the accuſative in the laſt; and the princeſs the accuſative in the firſt, and the nominative in the ſecond; and the words would be tranſlated accordingly, if turned into a language that has caſes. See Grammar.

ACCUSATORY, that which produceth or containeth an accuſation.

* *To* ACCUSE, to charge with a crime; to blame or cenſure.

ACCUSIORUM Colonia, in ancient geography, an inland town in the Cavares, in Gallia Narboneſis; now Grenoble, in Dauphine; which ſee.

To ACCUSTOM, to habituate, to enure, with the particle *to*. It is uſed chiefly of perſons.

ACCUSTOMABLE, of long cuſtom, of habit; habitual, cuſtomary.

ACCUSTOMABLY, According to cuſtom.

ACCUSTOMARILY, in a cuſtomary manner; according to common or cuſtomary practice.

ACCUSTOMARY, uſual, practiſed according to cuſtom.

ACCUSTOMED, according to cuſtom; frequent; uſual.

ACE. [*As* not only ſignified a piece of money, but an integer, from whence is derived the word *ace*, or unit.] 1. An unit; a ſingle point on cards or dice. 2. A ſmall quantity; a particle; an atom.

ACELDAMA, [Heb. a field of blood.] formerly called the Potter's field, and ſaid to have been ſituated S. of Jeruſalem, and N. of the rivulet Siloam: the field purchaſed by the Jewiſh rulers, with the 30 pieces of ſilver, which Judas returned to them, in deſpair, after betraying our Saviour; which they allotted as a burial place for ſtrangers. Modern travellers ſay, it is now covered with an arched roof, and will conſume a corpſe in a few days.

ACELUM, or Acelium, in ancient geography, a town of the Venetian territory, now called *Azolo*, ſituated to the weſt of Trevigi, at the ſource of the rivulet Muſone. Long. 105. E. Lat. 0. N.

ACENTETUM, or Acanteta, in natural hiſtory, a name given by the ancients to the pureſt and fineſt of rock cryſtal. They uſed it many ways; ſometimes engraving on it, and ſometimes forming it into vaſes and cups, which were held next in value to the *vaſa marrhinæ* of thoſe times. This cryſtal they obtaind from the iſland of Cyprus, but it was often faulty, having hairs, cracks and foulneſſes, which they called *salts*, in the middle of the large pieces. Pliny tells us, that when it was uſed for engraving on, the artiſt could conceal all theſe by the ſtrokes of his work; but when it was to be formed into cups or vaſes, they choſe the acentetum which had no blemiſhes.

ACEPHALI, in civil hiſtory, the levellers in the reign of Henry I. who acknowledged no head or ſuperior. They were reckoned ſo poor, that they had not a tenement by which they might acknowledge a ſuperior lord.

Acephali, or Acephalitæ, in eccleſiaſtical hiſtory, the denomination of divers ſects: who refuſed to follow a leader, or head: ſuch as, 1. Thoſe who in the affair of the council of Epheſus, refuſed to follow either St. Cyril, or John of Antioch. 2. Certain chriſtians of the 5th century, who at firſt followed Peter Mongus; but afterwards abandoned him, upon his ſubſcribing the council of Chalcedon; being generally of the opinion of Eutyches, that there was only one nature in Chriſt. 3. The adherents of Severus of Antioch; and of all in general who refuſed to admit the council of Chalcedon. 4. Biſhops, exempt from the juriſdiction of their patriarch, were alſo thus named.

Acephali is uſed in fabulous hiſtory, in ſpeaking of certain nations or people, repreſented by ancient naturaliſts and coſmographers, as well as by ſome modern travellers, as formed without heads, having their eyes, mouths &c. in their breaſt, ſhoulders, &c. but though the exiſtence of a nation of *Acephali* be incredible and abſurd, yet naturaliſts furniſh ſeveral inſtances of individuals born without heads, by ſome luſus or abberration of nature. Weſſer gives a catalogue of ſuch acephalous births from Schenkius, Licetus, Panceus, &c.

ACEPHALOUS. Without a head.

Acephalous worms, or what are ſuppoſed ſuch, are frequent.—The lumbricus latus, or joint-worm, and the tænia or tape worm, were long taken to be acephalous: the firſt who ſuppoſed them to have a head was Tulpius, and after him Fehr; the former even makes them biceps, or two-headed.

ACER, the **Maple** or **Sycamore Tree**: a genus of the monoœcia order, belonging to the polygamia claſs of plants; and ranking under the 23d Natural Order, Trifilatæ. The generic characters, both natural and eſſential are: The Hermaphrodite calyx is an acute, coloured, one-leafed perianthium, divided into ſegments, flat and entire at the baſe, and perſiſtent: The corolla is five-petal'd, ovate, and expanding: The ſtamina conſiſt of eight ſubulated ſhort filaments; the antheræ ſimple, the duſt cruciform: The piſtillum has a compreſſed germen, immerſed in the receptacle, which is convex, perforated, and large; the ſtylus is filiform; the ſtigmata are two, pointed, ſlender and reflex: The pericarpium conſiſts of two or three capſulæ uniting at the baſe, roundiſh, compreſſed, each terminated with a large membranous wing: The ſeeds are ſolitary and roundiſh. The Male calyx, corolla, and ſtamina, are the ſame as the hermaphrodite: The piſtillum has no germen nor ſtylus; the ſtigma is bifid. On the opening of the flower, the ſtigma alone appears; a few days after, the ſtylus.—The hermaphrodite flowers on the ſame umbel are frequently of two ſorts: the inferior ones feminine, the antheræ of which do not burſt, but the piſtillum quickly grows into a fruit: the ſuperior ones maſculine, of which the antheræ ſcatter their pollen, but the piſtilla without increaſing fall off.

The ſpecies are numerous, but ſix only are natives of the United States. 1. **Acer Saccharum**, the *ſugar maple*. This tree grows to the height of ſixty feet, and the ſtock to the diameter of two feet or more. It has broad thin leaves, reſembling the ſilver-leafed maple, but not ſo deeply loped, nor ſo large: they are divided into five parts: which are again indented or cut on the edges into ſeveral acute ſegments, and grow on pretty long footſtalks. It flowers in the manner of the ſcarlet maple, but the flowers are of an herbaceous colour, and produce large joined winged ſeeds. This is the tree which principally yields an excellent and wholeſome ſugar in conſiderable quantities; the ſilver-leafed maple alſo yields much ſap that affords ſugar; theſe have been moſt preferred, but all the ſpecies of maple found in the Union yield more or leſs.

2. **Acer Pennsylvanicum**, *Pennſylvania dwarf mountain maple*. This very much reſembles the ſugar maple, but its leaves are more pointed; it grows naturally in the uplands of Pennſylvania. The ſtocks are ſlender, riſing to the height only of about ſix or eight feet, and rammifying off in oppoſite limbs. The leaves are three pointed, much indented ſaw-wiſe, and placed uppoſite upon ſlender lengthy footſtalks. The flowers terminate the ſtalks in long erect cluſters; colour herbaceous, ſize ſmall, and in part ſucceeded by ſmall conjoined winged ſeeds.

3. **Acer Negundo.** The *Virginian aſh-leaved maple*. A very ſtrong ſhooting tree; it is diœceous, having male and female flowers upon different trees: but of a moderate ſize, rarely exceeding thirty feet; the leaves reſembling the aſh, but generally trifoliate or quinquefoliate, or conſiſting of three or five lobes, oval, ſomewhat pointed, and ſlightly notched towards the extremities. The flowers of the male are produced upon pendulous bundles of very long fine filaments, each bearing a ſmall perianthum at its extremity, containing five or more ſtamina. The female produces florets at the extremes of the branches in long looſe bunches; they have a deciduous empalement on an elongated ſtem, and contain a compreſſed germen, with ſcarce any ſtyle, but two reflexed ſtigmas.

4. **Acer Canadense.** *American ſtriped maple.* This is but of a moderate growth. The bark, eſpecially of the young ſhoots, is beautifully variegated or ſtriped. The leaves divide into three very ſharp pointed lobes, and very finely ſerrated on the edges. The flowers protrude in ſolitary bunches on ſhort ſtalks; having large petals and empalements, containing generally eight ſtamina or filaments; and in the hermaphrodite flowers two reflexed ſtigmas. The flowers and ſeeds a greeniſh yellow.

5. **Acer Rubrum.** *The Virginian ſcarlet flowering maple.* This grows in a rich ſoil to a conſiderable ſize. The leaves are ſometimes three and five-lobed, ſerrated edges. The flowers bud forth in beautiful umbils, of a ſcarlet colour, cloſely ſurrounding the ſmaller branches. The footſtalks of the hermaphrodite flowers, ſhoot out to conſiderable length, ſcarlet, and each ſuſtaining two winged conjoined ſeeds, of a paler luſtre. There is a variety of this ſpecies, with yellowiſh florets and ſeeds, which is the moſt common in Pennſylvania.

6. **Acer Glaucum.** *The ſilver leaved maple.* This tree grows to the height of fifty and ſixty feet, with numerous graceful ſpreading branches. The leaves five-lobed, deeply but irregularly dentated on the edges; of a lucid green colour on the ſuperior ſurface, on the inferior of a bright ſilver. The flowers are produced in ſmall umbils at the ſtem of the leaves, are of a dead red colour, and ſucceeded by large winged ſeeds which ſhed early in ſummer. This is ſuſpected to be the *acer rubrum* of Linnæus. For the method of making maple ſugar. See **Sugar**.

The foreign **Acers**, or maples,—7. The *pſeudo platanus*, or ſycamore, with ſmall flowers of a greeniſh white colour, of which there are two varieties. 8. The *campeſtris*, or common maple, plentiful in Engliſh hedge rows. 9. The *Platonoides*, or Norway maple, natives of Norway, Sweden, and other northern parts of Europe. The leaves exude an acrid milky juice which ſecures them from the depredations of inſects, that prey ſo much on the ſycamore. This ſpecies is choſen for ſituations expoſed to the ſea, as it reſiſts the ſpray. 10. The *Opalus*, or Italian maple, very common in the moſt parts of Italy, but eſpecially near Rome. 11. *Mouſpeſulanum*, or Montpelier maple, common to the ſouth of France and Italy. 12. The *Creticum* or Cretan maple, a native of Candia, or ancient Crete, and other places in the Levant.

The ancients prized the maple very highly. The timber they deemed better than beech for all the uſes of the turner, as diſhes, cups, &c. for all the uſes in inlaying it is well calculated; and peculiarly for muſical inſtruments. That which is moſt irregular in the grain is prized for cabinet-work. Pliny ſays of it, that for elegance and fineneſs it is next to the cedar. The white or Montpelier maple is eſteemed as very beautiful, as is that which grows on the *Po* and the foot of the Alps. Some of theſe, from the variegation of grain obtained the name of the peacock's-tail maple. The knobs of this maple were made into table books, and portable cabinets. The *Bruscum* was a blackiſh kind, of which the ancients made tables of ſo enormous a price that when the Romans upbraided their wives with extravagance in the purchaſe of pearls, &c. they were retorted upon with the extravagant price of their *maple tables*.

The ACER is propagated various ways, viz. 1. By SEEDS. All the different ſpecies, which are natives of this country may be eaſily propagated in this way. The keys, when ripe in autumn, may be gathered, and in a few days after ſown, about an inch and an half deep, in beds of common mould. In ſpring the plants will appear, and make a ſhoot of about a foot and a half, by the autumn following, if the ground be tolerably good, and they are kept free from weeds. The ſpring after they come up, they ſhould be planted in the nurſery, in rows 2 feet and a half aſunder, and their diſtance in the rows muſt be a foot and a half. Here they may remain till they are big enough to plant out finally, with no other trouble than taking off unſightly ſide branches, and ſuch as have a tendency to make the three forked; except digging between the rows, which muſt always be done every winter.—For the other ſpecies, as they do not ripen in this country, their ſeeds ought to be procured from the places where they naturally grow, and managed in the following manner: a cool ſhady part of the ſeminary ſhould be appropriated for the purpoſe: the mould ſhould be made fine; beds ſhould be marked out 4 feet wide, and in length proportionable to the quantity. In theſe the ſeed ſhould be regularly ſown, ſifting over them half an inch of the fineſt mould. When the plants come up, they muſt be kept clean from weeds, and frequently watered; and this muſt be duly attended to all ſummer. Next ſpring, the ſtrongeſt may be drawn out, and planted in the nurſery, in rows about 2 feet aſunder, and at the diſtance of a foot from each other in the rows; leaving the others in the ſeminary to gain ſtrength. The ſpring following they muſt alſo receive the ſame culture; and in the nurſery they may remain, with no other trouble than keeping the ground clean from weeds in ſummer, digging between the rows in winter, and taking off all ſtrong and irregular ſide ſhoots, till they are planted out. Trees raiſed from ſeeds will grow faſter, and arrive at greater height, than thoſe raiſed from layers: but they will not produce ſuch quantities of flowers; which makes the latter method more eligible for thoſe who want theſe plants for a low ſhrubbery.—Seeds of the variegated kinds alſo, when ſown, will produce variegated plants in return; which renders the propagation of theſe ſorts very expeditious, where plenty of ſeeds may be had. Where theſe are not to be obtained, the plants are propagated by budding, as afterwards directed.

2. By LAYERS. All the ſpecies may be propagated by this method; though it is never practiſed for the common maple and the ſycamore. The young ſhoots may at any time be laid down in the autumn, winter, or early in the ſpring. By the autumn following they will have ſtruck root, and become good plants; when the ſtrongeſt may be ſet out in the place where they are to remain; whilſt the weakeſt may be planted in the nurſery, like the ſeedlings, for a year or two to acquire ſtrength.

3. By CUTTING. This method is chiefly practiſed on the aſh-leaved and Norway maples, which more readily take root this way. The cuttings ſhould be the bottom parts of the laſt year's ſhoots: they ſhould be taken off early in October, and planted in rows in a moiſt ſhady place. The ſpring and ſummer following, they muſt be duly watered, as often as dry weather makes it neceſſary, and be kept clean from weeds. By autumn they will be fit to remove into the nurſery; though if the cuttings are not planted too cloſe, they may remain in their ſituation for a year or two longer, and then be ſet out finally, without the trouble of being previouſly planted in the nurſery.

4. By BUDDING, GRAFTING, and INARCHING. Theſe methods are only practiſed for the variegated ſorts and the large broad-leaved kind. The latter is to be continued no otherwiſe than by building it on ſtocks of the common ſycamore; for from the ſeeds, though ſo large themſelves, only the common ſycamore is produced. In order to propagate theſe varieties by budding, let ſome plants of the common ſycamore, one year old, be taken out of the ſeminary, and ſet in the nurſery in rows a yard aſunder, and the plants about a foot and a half diſtance from each other in the rows: Let the ground be kept clean from weeds all ſummer, and *turned in* in the winter; and the ſummer following the ſtocks will be of a proper ſize to receive the buds, which ſhould be taken from the moſt beautifully ſtriped branches. The beſt time for this work is the middle or latter end of Auguſt. Having then budded the ſtocks, with the eyes or buds fronting the north, early in October take off the baſs matting, which before this time will have confined the bark and pinched the bud, but not ſo as to hurt it much. Then cut off the ſtock juſt above the bud, and dig the ground between the rows. The ſummer following, keep the ground clean from weeds; cut off all natural ſide buds from the ſtock as they come out; and by autum, if the land is good, the buds will have ſhot forth, and formed themſelves into trees of 5 or 6 feet high. They may be then removed into the places where they are deſigned to remain; or a few of them only may be drawn out, leaving the others to be trained up for larger ſtandards. The ſtriped Norway maple ſhould be budded on ſtocks of its own kind; for on theſe they take beſt, and neither kind is very liable to run away from their colours. Variegated plants in general muſt be planted in poor, hungry, gravelly, or ſandy ſoils, to feed the diſeaſe which occaſions theſe beautiful ſtripes, and cauſe it to be more powerful. But theſe trees ſhow their ſtripes in greater perfection in a good ſoil: The plant, though in ſickneſs, has the appearance of health; the ſhoots are vigorous and ſtrong; the leaves are large, leſs liable to be hurt by inſects; and the ſtripes appear more perfect, natural, and beautiful, than thoſe on ſtunted trees growing on a poor ſoil.

ACERATOS, unmixed, uncorrupted. It is applied ſometimes to the humours of the body by Hippocrates. Paulus Ægineta mentions a plaſter under this name, but probably means *aceron*.

ACERB, acid, with an addition of roughneſs, as moſt fruits are before they are ripe.

ACERB, in medicine, an intermediate taſte between acid, auſtere, and bitter. All matters which come under this denomination are aſtringent.

ACERBITY, or Acerbitude, 1. A rough, ſour taſte. 2. Applied to men, ſharpneſs of temper: ſeverity.

ACERBITUDE. See laſt article.

ACERENZA, a ſmall town of the province of Baſilicata, in the kingdom of Naples, formerly the ſee of an archbiſhop. Long. 91. 5. E. Lat. 40. 20. N.

ACERIDES, plaiſters made without wax.

ACERINA, in ichthyology, a name given by Pliny and others of the old naturaliſts, to a fiſh we now call the cernua, and aurata fluviatilis, and in England the ruffe. It is a genuine ſpecies of perch, and diſtinguiſhed by Artedi from all the other fiſh of that genus, by having the back fin ſingle, and the head cavernous. See Perch.

ACERNO, a town of Italy, in the citerior principality of Naples, with a biſhop's ſee; ſituated 17 m. S. W. of Conza, and 12 N. E. of Salerno. Long. 90. 6. Lat. 40. 45. N.

ACEROSE, chaffy, or mixed with chaff.

ACEROSUS, the browneſt and coarſeſt ſort of bread, made of flour not ſeparated from the bran.

ACERRA, a town in the kingdom of Naples, in the Terra di Lavora, ſeated on the river Agno, 7 m. N. E. of Naples, and 20 S. W. of Benevento. Long. 89. 50. E. Lat. 40. 55. N.

ACCERA, in antiquity, an altar erected, among the Romans, near the bed of a perſon deceaſed, on which his friends daily offered incenſe till his burial.—The real intention probably was to overcome any offenſive ſmell that might ariſe about the corpſe. The Chineſe have ſtill a cuſtom like this: they erect an altar to the deceaſed in a room hung with mourning: and place an image of the dead perſon on the altar, to which every one that approaches it bows four times, and offers oblations and perfumes. By the laws of the XII tables, the erection of Acerræ, was prohibited among the Romans. The Acerra alſo ſignified a little pot, wherein were put the incenſe and perfumes to be burnt on the altars of the gods, and before the dead. The Jews had alſo their acerræ, in our verſion rendered cenſers, and the Romaniſts ſtill retain them under the name of incenſe pots.

ACERRÆ, in ancient geography, a town in the Clanius in Campania, now called Acerra, which ſee above.

Acerræ, in ancient geography, a town in the territory, and to the S. E. of Lodi, where the rivulet Serio falls into the Adda, W. of Cremona, and N. of Placentia. It is now called *La Girola*.

To ACERVATE, to heap up.

ACERVATION, the act of heaping together.

ACESCENT, that which has a tendency to ſourneſs or acidity.

ACESTA, curable diſeaſes.

ACESTIDES, the chimnies of furnaces where braſs was made, contrived narrrow at top, to receive the fumes of the melted metal, and collect them, that *Cadmia* might be produced in greater quantities.

ACESTIS, a fictitious ſort of Chryſocolla, made of Cyprian verdigriſe, the urine of children, and nitre.

ACESTRIDES, female phyſicians; midwives ſo called among the Greeks.

ACETABULUM, in anatomy, 1. a deep cavity, in certain bones, appointed for the reception of the large head of other bones, in order to their articulation, ſuch as that of the iſchium, which receives the head of the thigh bone. The acetabulum is lined, and capped round with a cartilage, whoſe circular margin is called ſupercilium. In its bottom lies a large mucilaginous gland. 2. The ſame with *Cotyledon*. 3. A glandular ſubſtance, found in the placenta of ſome animals.

Acetabulum, in antiquity, 1. a little vaſe, or cup, uſed at table, to ſerve up things proper for ſauce, or ſeaſoning; ſimilar to our vinegar cruets. Hence Agricola, in his treatiſe of Roman meaſures, takes the name to have been formed from acetum, vinegar; as ſuppoſing it principally deſtined to ſerve vinegar in. 2 A Roman meaſure, uſed both for liquid and dry things, chiefly in medicine. It contained a cyathus and a half, or 15 drachms, equal to about one eighth of a pint.

Acetabulum, in botany, navel-wort, a ſpecies of the peziza, or cup-piziza, a genus belonging to the cryptogamia fungi of Linnæus. It is named acetabulum, from the reſemblance its leaves bear to a cup.

ACETARIA, ſallad.

ACETARS, ſallads and vinegar.

ACETARY, a term applied by Nehemia Grew, in his anatomy of plants, to a pulpy ſubſtance in certain fruits, *e. g.* the pear, which is incloſed in a congeries of ſmall calculous bodies towards the baſe of the fruit, and is always of an acid taſte.

ACEDIFICATION, is uſed by ſome chemiſts to denote the operation whereby vinegar is made. It is a ſpecies of fermentation, ariſing from expoſing various liquors in open veſſels, and a warm place, which turns them acid. Acetification chiefly differs from the fermentation whereby wine is made, in this, that the latter is effected by a gentler heat, ſufficient only to raiſe, and rarify the ſulphurous parts; whereas, in acetification, there is what is ſufficient to raiſe and rarify the ſaline parts.

Aceti, spiritus, in chemiſtry, ſpirit of vinegar. It is made by drenching copper filings with diſtilled vinegar and repeatedly evaporating it.

ACETOSA, Sorrel; by Linnæus joined to the genus of Dock, under the title of *Rumex*.

ACETOSELLA, in botany, wood ſorrel, a ſpecies of Oxalis.

ACETOUS, having the quality of vinegar, ſour.

Acetous acid, vinegar.

Acetous æther, an æther made by means of vinegar.

Acetous fermentation, that by which vinigar is produced.

ACETUM, in medicine, chemiſtry, &c. vinegar; the vegetable acid. See Vinegar. There are ſeveral medicines, of which it is the baſis; as,

1. Acetum alkalizatum, alkalized vinegar, diſtilled vinegar, with the addition of ſome alkaline, or volatile ſalt.

2. Acetum distillatum, diſtilled vinegar, chiefly uſed in preparations for diſſolution and precipitation.

3. Acetum esuriens, appetitive vinegar, the richeſt acid, according to Boerhaave, that can by any art be perpared from vinegar. It is made by diſſolving verdigriſe in

diſtilled vinegar, evaporating the ſolution, and after recovering the chryſtalized verdigriſe, diſtilling the acid ſpirit by a retort.

4. Acetum philosophorum, philoſophers vinegar, a ſour kind of liquor; made by diſſolving a little butter of antimony in a great deal of water.

5. Acetum rosarum, vinegar of roſes; this is made of roſe buds infuſed in vinegar 40 or 50 days; the roſes are then preſſed out, and the vinegar preſerved. It is chiefly uſed by way of embrocation on the head and temples, in the head-ache.

6. Acetum sambucinum, vinegar of elder.

7. Acetum Scilliticum, vinegar of ſquills, &c. For theſe and other medicated vinegars. See Vinegar. They are much uſed in Germany as antitodes againſt peſtilential diſeaſes.

ACHABYTUS, in ancient geography, a high mountain in Rhodes, on the top of which ſtood a temple of Jupiter.

ACHAÇ, in ornithology, a bird common in the Philippine iſlands. It is of the ſize of a common hen; its belly, breaſt, and neck, are of a pale brown, and its back of a duſty reddiſh colour; the wings are extremely beautiful, being principally of a greeniſh blue colour; the tail is white, ſhort, and continually in motion; the eyes are black, and the beack is thick, ſtrong, and of a black colour, and obtuſe figure; the legs are reddiſh, and the claws black. When it makes any noiſe, it ſeems to utter the word *phi*, *phi*, very often repeated. It lives chiefly about the cultivated parts of the iſlands, and feeds on rice, and other vegetables, being properly of the patridge kind.

ACHÆA, in ancient geography, a town of the iſland of Rhodes, in the diſtrict of Jalyſus, and the firſt and moſt ancient of all, ſaid to be built by the Heliades, or grandſons of Apollo.

ACHÆANS, the inhabitants of Achaia Propria, a Peloponneſian ſtate. This republic was not conſiderable in early times, for the number of its troops, its wealth, or the extent of its territories; but it was famed for its probity, its juſtice, and love of liberty. Its high reputation for theſe virtues was very ancient. The Crotonians and Sybarites, to re-eſtabliſh order in their towns, adopted the laws and cuſtoms of the Achæans. After the famous battle of Leuctra, a difference aroſe between the Lacedemonians and Thebans, who held the virtue of this people in ſuch veneration, that they terminated the diſpute by their deciſion. The government of the Achæans was democratical. They preſerved their liberty till the time of Philip and Alexander: But in the reigns of thoſe princes, and afterwards, they were either ſubjects to the Macedonians, who had made themſelves maſters of Greece, or oppreſſed by cruel tyrants. The Achæan commonwealth conſiſted of twelve inconſiderable towns in Peloponneſus. Its firſt annals are not marked by any great action, for they are not graced with one eminent character. After the death of Alexander, this little republic was a prey to all the evils which flow from political diſcord. A zeal for the good of the community was now extinguiſhed. Each town was only attentive to its private intereſt. There was no longer any ſtability in the ſtate; for it changed its maſters with every revolution in Macedonia. Towards the 124th Olympiad, about the time when Ptolemy Soder died, and when Pyrrhus invaded Italy, the republic of the Achæans recovered its old inſtitutions and unanimity. The inhabitants of Patæ and of Dymæ were the firſt aſſertors of ancient liberty. The tyrants were baniſhed, and the towns again made one commonwealth. A public council was then held, in which affairs of importance were diſcuſſed and determined. A regiſter was appointed to record the tranſactions of the council. This aſſembly had two preſidents, who were nominated alternately by the different towns. But they ſoon elected but one. Many neighbouring towns which admired the conſtitution of this republic, founded on equality, liberty, the love of juſtice, and of the public good, were incorporated with the Achæans, and admitted to the full enjoyment of their laws and privileges.—The arms which the Achæans chiefly uſed were ſlings. They were trained to the art from their infancy, by ſlinging from a great diſtance, at a circular mark of a moderate circumference. By long practice, they took ſo nice an aim, that they were ſure, not only to hit their enemies on the head, but on any part of the face they choſe. Their ſlings were of a different kind from thoſe of the Balearians, whom they far ſurpaſſed in dexterity.

ACHÆI, Achæans; 1. The inhabitants of Achaia Propria. 2. The inhabitants of Achæa. 3. In Livy, the people of Greece; for the moſt part called *Achivi*, by the Roman poets. 4. In Homer the general name for the Grecians. See laſt article.

ACHÆORUM-PORTUS, in ancient geography, the name of two harbours, viz. 1. one near Sigæum; into which Xanthus falls, after being joined by the Simois; and, 2. one of the Taurica Cherſoneſus, on the Euxine ſea, now called Porto Buon.

ACHAIA, in ancient geography, that part of Greece which Ptolemy calls Hellas, and the younger Pliny, Græcia. It is now called Livadia; and is bounded on the N. by Theſſaly, the river Sperchius, the Sinus Maliacus, and mount Oeta; on the W. by the river Achelous; on the E. turning a little to the N. it is waſhed by the Archipelago, down to the promontory of Sunium, and on the S. joined to the Peloponeſus, or Morea, by the iſthmus of Corinth, five miles broad. See Livadia.

Achaia Propria, in ancient geography, a ſmall diſtrict, N. of Peloponneſus, running weſtward along the bay of Corinth, and bounded on the W. by the Inoian Sea, on the S. by Elis and Arcadia, and on the E. by Sicyonia: its metropolis was called *Pathæ*. It is now called *Romania Alta*, in the Morea.

Achaia was alſo taken for all thoſe countries that were joined in the Achæan league, and were reduced by the Romans to a province. Likewiſe for Peloponneſus.

ACHAIÆ Presbyteri, the Preſbyters of Achaia, were thoſe who were preſent at the martyrdom of St. Andrew, the apoſtle, A. D. 59; and are ſaid to have written an epiſtle in relation to it, Bellarmin, and ſeveral other eminent writers in the church of Rome, allow it to be genuine; while Du Pin, and ſome others expreſsly reject it.

ACHALALACTLI, in ornithology, an American bird, deſcribed by Nieremberg, remarkable for a ring of ſilvery whiteneſs round its neck. It is of the ſize of a pigeon, its beak ſharp, and three finger's breadth long, and its head is ornamented with a very long creſt, of a bluiſh black colour. The belly and under ſide of the wings are white, and the back and outſide of the wings are of the colour of the creſt, of a bluiſh black and variegated with white ſpots ; the tail is partly black and partly blue. It is common about the lakes and rivers of Mexico, and feeds on ſmall fiſh.

ACHAM, a country in Aſia, bounded on the N. by Boutan, on the E. by China, on the S. by Burmah, and on the W. by Indoſtan. It is very little known to Europeans.

ACHAMELLA, or ACMELLA, in botany, a plant that grows in the iſland of Ceylon, of which there are three ſpecies. It is recommended in nephritic diſorders.

ACHAOVA, in the Materia Medica of the ancients, the name of a herb much celebrated in many diſtempers ; but we are not much aſſured at preſent what is the plant that it truly belongs to. Some have ſuppoſed it the Egyptian *ucbove*, an herb nearly reſembling chamomile, but lower, and with broader leaves, approaching to thoſe of the fever-few, and of a faint, but not diſagreeable ſmell. Avicenna ſeems, however, to have meant a different plant by this name ; probably the herb we call *marum*.

ACHARACE, in ancient geography, a town of Lydia. ſituated between Tralles and Nyſa ; in which were the temple of Pluto, and the cave Charonium, where patients ſlept in order to obtain a cure.

ACHATES, in natural hiſtory, the AGATE, which ſee.

ACHATES, in ancient geography, a river of Sicily, now *Drillo* ; which runs from north to ſouth, almoſt parallal with, and at no great diſtance from, the Gela ; and riſes in the north of the territory of Noto. It gave name to the Achates, or Agate, ſaid to be firſt found there.

ACHAZIB, or ACHZIB, in ancient geography, 1. A town of Gallilee, in the tribe of Aſher, 9 miles from Ptolemais. 2. A town on the ſouthern parts of the tribe of Judah.

ACHE, in botany, a name given by ſome old authors, to the plant called apium paluſtre, or paludapium ; in Engliſh, ſmallage.

ACHE, in farriery, a diſeaſe of horſes, that occaſions a numbneſs of the joints.

To ACHE. To be in pain.

ACHEEN, ACHEM, or ACHEN, a kingdom on the N. W. part of the iſland of Sumatra, in the Indian Ocean, now very different from what it was, in the beginning of the 16th century, when it was ſo powerful as to expel the Portugueſe from the iſland, where they repeatedly attempted to ſettle ; and when its ſovereigns received embaſſies from ſome of the greateſt potentates of Europe. Though no longer the great mart of eaſtern commodities, it ſtill carries on a conſiderable trade with the natives of that part of the coaſt of Indoſtan, called *Telinga*, who ſupply it with the cotton goods of their country, and receive in return, gold duſt, ſapan wood, betel nut, patch leaf (*colsus Indicus*,) a little pepper, ſulpur, camphire, and benzoin. The country is ſupplied with Bengal opium, and alſo with iron, and many other articles of merchandize, by the European traders. Acheen is eſteemed comparitively healthy, being more free from woods and ſwamps than moſt other portions of the iſland ; and the fevers and dyſenteries, to which theſe are ſuppoſed to give occaſion, are there ſaid to be uncommon. The ſoil is light and fertile ; and the products, beſides thoſe already enumerated as articles of export trade, and a variety of fine fruits, are chiefly rice and cotton, There is likewiſe ſome raw ſilk procured in the country, of very inferior quality. Gold duſt is collected in the mountains of Acheen, but the greateſt part is brought from the ſouthern ports of Nalaboo and Sooſoo. The ſulphur is gathered from a volcano mountain in the neighbourhood, which ſupplies their own conſumption for the manufacture of gun-powder, and admits of a large exportation. The monarchy is hereditary ; and the king uſually maintains a guard of 100 Seapoys about his palace. According to Mr. Marſden, "the grand council of the nation conſiſts of, the King or *Sultan*, four *Oolooballangs*, eight of a lower degree, who ſit on his right hand, and 16 *Cajoorangs* who ſit on his left. At the king's feet ſits a woman, to whom he makes known his pleaſure ; who communicates it to a eunuch, and he to an officer, named *cajoorang Gondong*, who then proclaims it aloud to the aſſembly. There are alſo preſent two officers, one of whom has the government of the *bazar* or market, and the other the ſuperintending and carrying into execution the puniſhment of criminals.

All matters relative to commerce and the cuſtoms of the port come under the juriſdiction of the *Shabandar*, who performs the ceremony of giving the *chap* or licence for trade ; by lifting a golden hafted creeſe over the head of the merchant, without which he dares not land his goods. Preſents, the value of which are become pretty regularly aſcertained, are then ſent to the king and his officers. If the ſtranger be an ambaſſador, the royal elephants are ſent down to carry him and his letters to the monarch's preſence ; which is done with a great deal of formal ceremony. The throne was ſome years ago of ivory and turtoiſe ſhell ; and when the place was governed by queens, a curtain of gauze was hung before it, which did not obſtruct the audience, but prevented any perfect view. The ſtranger, after ſome general diſcourſe, is then conducted to a ſeparate building, where he is entertained with the delicacies of the country, by the officers of ſtate, and in the evening returns in the manner he came, ſurrounded by a prodigious number of lights. On high days the king goes in great ſtate, mounted on an elephant richly capariſoned, to the great moſque, preceded by his oolooballangs ; who are armed nearly in the European manner."—The country of Acheen is divided into three diſtricts, and named *Duo-pooloo-duo*, *Duo-pooloo-leemo*, and *Duo-pooloo-anam*. Each diſtrict is governed by a pangleemo, and under him an imaum and four pangeeches to each moſque.

ACHEEN, or ACHEM, the capital of the kingdom ſo called, lies 1000 miles S. E. of Madras, and is ſituated on a river, which empties itſelf into the N. W. point or Acheen-head, about two miles from the mouth, in a wide valley, formed like an amphitheatre by two lofty ranges of hills. The river is not large, and by emptying itſelf in ſeveral channels, is rendered very ſhallow at the bar. In the dry monſoon, it will not admit boats of any burden, much leſs large veſſels, which lie without, in the road formed by the iſlands off the point. The appearance of the town, and the nature of the buildings, are much the ſame as are found in the generality of Malay bazars, excepting that the ſuperior wealth of this place has occaſioned a great number of public edifices, but without the ſmalleſt pretenſions to magnificence. The kings palace, if it deſerves the appellation, is a very rude and uncouth piece of architecture, deſigned to reſiſt the force of an enemy, and ſurrounded for that purpoſe by ſtrong walls, but without any regular plan, or view to the modern ſyſtem of military attack. The houſes in common are built of bamboos and rough timber, and raiſed ſome feet from the ground on account of the place being overlooked in the rainy ſeaſon. A conſiderable fabric of a thick ſpecies of cotton cloth, and of ſtuff for the ſhort drawers worn both by Malays and Acheneſe, is eſtabliſhed here and ſupplies an extenſive demand. They weave alſo very handſome ſilk pieces, of a particular form, for that part of the dreſs which is called by the Malays *cayen ſarrong*. Long. 168.34. E. Lat. 5.22. N.

ACHELOS, a river of Acarnania; which riſes in mount Pindus, and dividing Ætolia from Acarnania, falls from N. to S. into the Sinus Corinthiacus. It was formerly called Thoas, from its impetuoſity, and, by Homer, King of rivers. It is now called Aſpro Potamo.

ACHEM, or Achen. See Acheen.

ACHEMENIS, an herb mentinoned by Pliny; ſuppoſed by the ancients to have the property of exciting terror.

ACHENESE, the inhabitants of Acheen. In their perſons they differ from the reſt of the Sumatrans; being taller, ſtouter, and darker complexioned. They appear not to be a genuine people; but are thought, with great appearance of reaſon to be a mixture of Battas, Malays, and Moors from the weſt of India. In their diſpoſitions they are more induſtrious than their neighbours; they poſſeſs more penetration and ſagacity; have more general knowledge; and, as merchants, they deal upon a more extenſive and liberal footing. Their religion is Mahometaniſm; and having a great number of moſques and prieſts, its forms and ceremonies are ſtrictly obſerved. The Acheneſe are expert and bold navigators, and employ a variety of veſſels, according to the voyages they undertake, and the purpoſes for which they deſign them. The river is covered with a multitude of fiſhing ſampans or canoes, which go to ſea with the morning breeze, and return in the afternoon, with the ſea wind, full laden. Having no convenient coins, though moſt ſpecies of money will be taken there at a valuation, they commonly make their payments in gold duſt, and for that purpoſe are all provided with ſcales or ſmall ſteelyards. Thay carry their gold about them, wrapped up in pieces of bladder, and often purchaſe to ſo ſmall an amount, as to make uſe of grains or ſeeds for weights. The Acheneſe have ever been remarkable for the ſeverity with which they puniſh crimes. The ſame rigour ſtill ſubſiſts, and their is no commutation admitted, as is eſtabliſhed in the ſouthern counties. There is great reaſon, however, to conclude, that the poor alone feel the rod of juſtice; the nobles being ſecure from retribution by the number of their dependants. Petty theft is puniſhed by ſuſpending the criminal from a tree, with a gun or heavy weight tied to his feet; or by cutting off a finger, a hand, or leg, according to the nature of the theft. Many of theſe mutilated and wretched objects are daily to be ſeen in the ſtreets. Robbery on the high-way and houſe-breaking are puniſhed by drowning, and afterwards expoſing the body on a ſtake for a few days. If the robbery is committed upon an imaum or prieſt, the ſacrilege is expiated by burning the criminal alive. A man who is convicted of adultery is ſeldom attempted to be ſcreened by his friends, but is delivered up to the friends and relations of the injured wife, who take him to ſome large plain, and forming themſelves in a circle, place him in the middle: a large weapon called a *Gadoobong*, is then delivered to him by one of his family; and if he can force his way through thoſe who ſurround him, and make his eſcape, he is not liable to further proſecution: but it commonly happens that he is inſtantly cut to pieces. In this caſe his relations bury him as they would a dead buffalo, refuſing to admit the corpſe into their houſe, or to perform any funeral rites. Theſe diſcouragements to vice might ſeem to beſpeak a moral and virtuous people: yet all travellers agree, in repreſenting the Acheneſe as one of the moſt diſhoneſt and flagitious nations of the Eaſt. See Sumatra.

ACHERON, a river of Theſprotia, in Epirus; which, after forming the lake Acheruſia, at no great diſtance from the promontory of Chimerium, falls into the ſea near it, to the weſt of the Sinus Ambracius, in a courſe from N. to S. It is now called Delichi.

Acheron, or Acheros, a river of the Bruttii in Italy, running from E. to W. where Alexander king of Epirus was ſlain by the Lucani, being deceived by the oracle of Dodona, which bid him beware of Acheron, which he ſuppoſed to mean Acheron in his own kingdom.

ACHERSET, an ancient meaſure of corn, conjectured to be the ſame with the Engliſh quarter, or eight buſhels.

ACHERUSIA, in ancient geography, 1. A lake between Cumæ and the promontory Miſenum, now *Il Lag. Della Collucia.* Some confound it with the *Lacus Lucrinus*, and others with the *Lacus Averni.*—2. A lake of Epirus through which the Achoron runs.—3. A peninſula of Bithynia on the Euxine, near Heraclea.

ACHETA, in natural hiſtory, a name by which the ancents called the larger ſpecies of *cicada*, the nymphs of which they uſed to eat, and eſteemed an excellent food: the ſmaller kind, which ſeems to have been our middling ſort (for we have three kinds,) they called tettigenia.

ACHIA, a kind of cane which grows in the Eaſt Indies, and is pickled there while green, with ſtrong vinegar and pepper, together with ſome other ſpices and ingredients.

ACHIÆNUS, or Achæinus, in natural hiſtory, a word uſed by the ancients to expreſs a ſtag or deer, in the ſecond year's age. In the firſt it was called nebrus, in the third dicrotus, and always after that ceraſtes.

ACHIAR is a Malayan word, which ſignifies all ſorts of fruits and roots pickled with vinegar and ſpice. The Dutch import from Batavia all ſorts of achiar, but particularly that of Bamboo, a kind of cane which grows in the Eaſt Indies. It is preſerved there whilſt it is ſtill green, with very ſtrong venegar and ſpice; and is called bamboo-achiar. The name changes according to the fruit of which the achiar is made.

ACHICOLUM, in antiquity, was uſed to expreſs the fornix, tholes, or ſudatorium of the ancient baths: which was a hot room where they uſed to ſweat. It is alſo called architholus.

To ACHIEVE, to perform, to finiſh a deſign proſperouſly.

ACHIEVER, he that performs; he that obtains what he endeavours after.

ACHIEVEMENT; 1. The performance of an action.

2. The eſcutcheon, or enſigns armorial, granted to any man for the performance of great actions.

ACHILLÆA, Yarrow, Milfoil, Nosebleed, or Sneezewort; a genus of the order of the polygamia ſuperflua, belonging to the ſyngeneſia claſs of plants. The natural order to which it belongs is the 49th Compoſitæ diſcoides. The characters are: The common calyx is ovate and imbricated, with ovate, acute, converging ſcales. The compound corolla is rayed; the hermaphrodite corollets are tubular in the diſc, the feminine linguiform, and from 5 to 10 in the rays: The proper corolla of the hermaphrodites is funnel-ſhaped, expanded, and divided into five ſegments; that of the female tongue-ſhaped, inverſely cordated, expanding, and of 3 ſegments: The ſtamina in the hermaphrodites conſiſt of 5 very ſhort capillary filaments; the anthera is cylindric and tubular. The piſtillum in the hermaphrodites has a ſmall germen; the ſtylus is filiform the length of the ſtamina; the ſtigma is obtuſe and end-notched: in the females, the germen is ſmall; the ſtylus is filiform; the ſtigmata are 2, obtuſe and reflected. The pericarpium is wanting; the calyx ſcarcely changed; the receptacle filiform, elongated at the diſc of the ſeeds, ovate, and twice as long as the calyx. The ſeeds are ſolitary, ovate, and furniſhed with a lock of wool; no papus. The receptaculum is chaffy and elevated. There are 20 ſpecies, of which the following are the principal:

1. Achillæa abrotanifolia, or tall eaſtern yarrow, is a native of the iſlands in the Archipelago: it grows to the height of 2 feet and a half, with large umbels of yellow flowers on the top; the leaves reſemble thoſe of the common wormwood, and are cut into long narrow ſegments.

2. Achillæa Ageratum, or ſweet maudlin, was formerly much uſed in medicine and for culinary purpoſes, but has now fallen ſo much into neglect as to be totally unknown in the markets; ſo that when it is demanded, the white maudlin is ſubſtituted in its ſtead. The reaſon of this ſubſtitution was, that the latter is more hardy and eaſily propagated than the ſweet maudlin, which is apt to rot in wet winters. The common maudlin flowers in June and July, and the ſeeds are ripe in September.

3. Achillæa alpina, or white maudlin, bear ſome reſemblance to the common ſneeze-wort; but the leaves are longer, of a deeper green colour, and deeply indented in their edges; the flowers are white, and the roots creep far underground. It riſes in good land, and to the height of 4 feet.

4. Achillæa clavenna, or Alpine umbelliferous wormwood, takes its name from the mountains of which it is a native. It ſeldom grows above 6 or 7 inches in height; it ſupports umbels of white flowers, like thoſe of the common ſneezewort, which appears in April and May. The leaves are ſilvery, and ſhaped like thoſe of the wormwood, and often decay in autumn and winter.

5. Achillæa Ægyptiaca, or hoary ſneezewort, is a native of the Archipelago. It hath very hoary leaves, which remain all the year; and the plants growing cloſe and low, make a pretty appearance at all ſeaſons. The flowers are yellow, and are produced in umbels on the top of the ſtalks; they appear in June, and continue till the end of September.

6. Achillæa macrophylla, or Alpine ſneezewort, with feverfew leaves, is a native of the Alps. It produces many ſtalks, riſing near 2 feet high; having looſe branching umbels of white flowers on their top, reſembling thoſe of the common ſneezewort, but larger.

7. Achillæa millefolium, the hundred leaf graſs, or common yarrow, grows naturally on banks, and by the ſides of foot-paths, in moſt parts of Britain. It commonly bears white flowers, though a variety of it is found which bears purple ones, but it does not long continue to bear flowers of this colour, if tranſplanted into gardens. It was formerly uſed in medicine; but is now ſeldom preſcribed. It creeps greatly by its roots, and alſo multiplies by the ſeeds, ſo that it becomes a troubleſome weed where it is once allowed to get a footing. The cultivation of it is recommended by Dr. Anderſon, in his Eſſays on Agriculture, as proper food for cattle. This ſpecies was the proper achillæa of the ancients, ſo named from Achilles; who, having been the diſciple of Chiron, firſt brought it into uſe for the cure of wounds and ulcers.

8. Achillæa Nana, or hoary Alpine milfoil, is a native of the Alps; the leaves are hoary, and the umbels of its flowers are more compact than thoſe of the Macrophylla; the ſtalks do not riſe above a foot high.

9. Achillæa Nobilis, or ſweet milfoil, approaches to the nature of the common milfoil; but its leaves are of a paler green, and are neither ſo long, nor ſo much cut off, as thoſe of the common milfoil are: they have a ſtrong, ſweet ſcent when bruiſed.

10. Achillæa Ptarmica, or common ſneeze-wort grows wild in the woods, and other ſhady places, in many parts of England; ſo is not admitted into gardens. There is a variety, however, with double flowers, which is preſerved in gardens, and is commonly known by the name of *double maudlin*. This ſpecies creeps greatly by the roots, ſo as ſoon to overſpread a large ſpot of ground. If planted in pots, ſo as to confine its roots from creeping, the ſtalks grow cloſe together, and make a tolerable appearance when in flower; but when at a diſtance, ſo that the roots have full liberty to run, the flowers appear but indifferently.

11. Achillæa Santolina, or eaſtern ſneezewort, is ſometimes cultivated in gardens; it has large yellow flowers, which ſtand upon pretty long footſtalks placed ſingly, not in bunches as in the common kind. It has leaves like the lavender-cotton, which, when rubbed, emit a ſtrong oily odour. The flowers appear in June and July.

12. Achillæa Tanacetifolia, or tanſey leafed ſneezewort, ſeldom riſes above ſix inches in height. The flowers are nearly as large as thoſe of the common ſneezewort, white, and growing in flat umbels. They appear in June and July. The leaves have ſome likeneſs to thoſe of the common wormwood, are very hoary, grow cloſe to the ground, and decay in autumn, ſo as to make little appearance in winter. It is a native of the Alps.

13. Achillæa Tomentosa, or woolly yarrow, is a native of the ſouth of France, and Spain, but lives in the open air in England. The flowers are of a bright yellow, and continue long in beauty, growing in cluſters at the top of the ſtalks, which ſeldom riſe above a foot high. The leaves are finely cut, and very hoary. Moſt of theſe ſpecies

of Achillæa are likewiſe to be found in different parts of the United States.

Achillæa, in the ancient Materia Medica, a name given to the gum, which is now called *sanguis draconis*, or dragons blood. The ancien Greeks called this *cinnabari;* and the of uſe the word, forthe mineral we now call cinnabar, was only becauſe of its being of the ſame fine red colour, with this gum. Avicenna, treating of the achillæa, ſays, it is otherwiſe called ſanguie draconis and deſcribes it as a red gum univerſally known in his time.

ACHILLES, in logic, a name which the ſchools give to the principle argument alledged by each ſect of philoſophers in behalf of their ſyſtem. In this ſenſe, we ſay, this is his *Achilles*; that is, his maſter proof; alluding to the ſtrength and importance of Achilies among the Greeks.

ACHILLIS TENDO, in anatomy, is a ſtrong tendinous cord, formed by the union of the tendons of the 4 extenſor muſcles of the foot, and inſerted into the os calcis. It has its name from the fatal wound Achilles is ſaid to have received in that part, from Paris the ſon Priam.

ACHING, pain: uneaſineſs.

ACHIOTE, in botany, a name given by ſome authors to the uraca, or arnotto, called orleata, and orellana, by others. This tree grows chiefly in very hot countries, as Yucatan or Campeche, and Guatimala. It is about the ſize of a plum tree, only more tufted; its branches being longer than the trunk. The fruit is incloſed in a rind like a cheſnut, except that it is of an oval figure. It begins to open croſs ways from the middle of the top, and ſubdivides into four parts: having, in the middle, a beautiful carnation-coloured flower. The tree has no leaves; but ſhoots out filaments like thoſe of ſaffron, only bigger and longer. Between theſe grow little ſoft vermillion-coloured grains, about the ſize of pepper corns; which the Indians, ſeparating from the filament, bake in cakes of about half a pound each; in which form the drug is brought into Europe.

ACHIOTTE, or Achioti, a foreign drug, uſed in dying, and in the preparation of chocolate. It is the ſame with the ſubſtance more uſually known by the name of arnotto.

ACHIVI, the Greeks, ſo called by the Roman poets.

ACHLYS, in medicine, 1. A darkneſs or dimneſs of ſight, ariſing from a ſmall cicatricula on the pupil, occaſioned by a ſuperficial ulcer on the cornea. 2. A diſorder of the womb; anſwering to what Latin writers call ſuffuſio uteri.

Achlys, in mythology, the firſt being, who exiſted before the creation of the world, of chaos, and of the gods.

ACHMETHA, a place mentioned by Ezra, vi. 2. wherein the decree of Cyrus, for rebuilding the temple of Jeruſalem, was found. Some think it means Ecbatana the capital of Media; others, that it was a kind of regiſter office, wherein the public records, and immutable decrees of the Medo-Perſian monarchs were kept.

ACHMETSCHET, a town of Crim Tartary, in the Ruſſian provence of Taurida, and government of Catharinenſlaf. It is the reſidence of the Sultan Galga, eldeſt ſon of the Khan of Tartary. Long. 128. 20. E. Lat. 45. 0. N.

ACHMIM, a large town of Upper Egypt, ſituated on the eaſtern bank of the Nile. "One admires there (ſays Abulfeda, as quoted by Mr. Savary,) a temple, which is equal to the moſt celebrated monuments of antiquity. It is conſtructed with ſtones of a ſurpriſing ſize, on which are ſculptured innumerable figures." Though this town be fallen from its ancient ſplendor, it is ſtill one of the moſt beautiful of Upper Egypt. An Arabian prince commands in it, and the police is well attended to. The ſtreets are wide and clean, and commerce and agriculture flouriſh. It has a manufactory of cotton ſtuffs, and pottery, which are conveyed over all Egypt. It is the ſame that Herodotus calls *Chemmis*, and Strabo *Panopolis*, or the city of Pan, who was worſhipped there. Herodotus ſays, that Perſeus was a native of this city, and that his deſcendants had eſtabliſhed feſtivals there in his honour. It has loſt its ancient edifices, and much of its extent; the ruins of the temple, deſcribed by Abulfeda, being without its limits, to the north. Nothing remains of it but ſome ſtones, of ſuch magnitude, that the Turks have not been able to move them. They are covered with hieroglyphics. On one of them are traced four concentric circles, in a ſquare. The innermoſt of theſe contains a ſun. The two next, divided into 12 parts, contain the one, 12 birds, the other, 12 animals almoſt effaced, which appeared to be the ſigns of the zodiac. The fourth has no diviſions, and preſents 12 human figures; which Mr. Savary imagines to repreſent the 12 gods; the 12 months of the year, and the 12 ſigns of the zodiac. The Egyptians, ſays Herodotus, were the firſt who divided the year into 12 months, and gave them the names of the 12 gods. The four ſeaſons occupy the angles of the ſquare, on the ſide of which may be diſtinguiſhed a globe with wings. Mr. Savary thinks it probable, that this ſtone belonged to a temple dedicated to the ſun, and that the whole of theſe hieroglyphics mark his paſſage into the ſigns of the zodiac. The columns of this temple have been partly broken, to make lime and mill-ſtones. Some of them have been tranſported into one of the moſques of Achmim, where they are placed without taſte; others are heaped up in the ſquares of the town. Mr. Savary tells us of a ſerpent which is worſhipped here, and is the wonder of the country. See Haridi.

ACHNE, chaff, froth, lint, ſmoke, or any thing light.

Achne, in medicine, is uſed by Hippocrates to denote a white mucilage, obſervable to the eyes of patients who have fevers; and alſo a white mucus in the fauces, thrown up from the lungs.

ACHONRY, a ſmall town of Ireland, ſeated on the Shannon, in the county of Sligo, and province of Connaught.

ACHOR, a ſpecies of the herbes; it appears with a cruſty ſcab, which cauſes an itching on the ſurface of the head, occaſioned by a ſharp ſerum oozing through the ſkin.

Achor, a valley of Jerico, lying along the Jordan, not far from Gilgal.

Achor, in medicine, the third ſpecies of tinea, or ſcald-head. It is a ſort of ſmall running ulcer on the face and head, chiefly of children while they ſuck; by which the ſkin is broke into a number of little holes, out of which iſſues a viſcid humour, like *ichor*, whence its name.—Achor differs from the favus and tinea only in the degree of virulence. It is called favus when the perforations are large, and tinea, when they are like thoſe which are made by moths in cloth.

Achor, in mythology, the god of flies: to whom, according to Pliny, the inhabitants of Cyrene ſacrificed, in order to obtain deliverance from the inſects, and the diſorders occaſioned by them.

ACHRADINA, in ancient geography, one of the four diviſions of Syracuſe, and the ſtrongeſt, largeſt, and moſt beautiful part of it; ſeparated by a very ſtrong wall from the outer town, Tycha and Neapolis. It was adorned with a very large forum, with beautiful porticos, a moſt elegant prytaneum, a moſt ſpacious ſenate houſe, and ſuperb temple of Jupiter Olympius.

ACARAS, or Sapota Plum: a genus of the monogynia order, belonging to the hexandria claſs of plants; and ranking in the 43d Natural Order, Dumoſæ. The characters are: The calyx is a perianthium, conſiſting of ſix ovate concave erect leaflets, the exterior ones broader and ſhorter, the interior ones coloured. The corolla is compoſed of one ovate petal, the height of the calyx; the border divided into ſix ſegments. The ſtamina have ſix ſhort ſubulated filaments at the throat of the coralla; and the antheræ are acute. The piſtillum has a roundiſh depreſſed germen; the ſtylus is ſubulated, and longer than the corolla; the ſtigma is obtuſe. The pericarpium is a globular twelve-celled pomum, with very ſoft fleſh. The ſeeds are ſolitary, ovate, and gloſſy. There are four ſpecies, all natives of the Weſt-Indies. The two principal are,

Achras mammosa. It is very common in Jamaica, Barbadoes, and moſt of the Weſt-India iſlands, where the trees are planted in the gardens for their fruit, which is by many greatly eſteemed. They grow to the height of 35 or 40 feet, having a ſtright trunk covered with an aſh-coloured bark. The branches are produced on every ſide, forming a regular head; and are beſet with leaves near a foot long, and almoſt three inches broad in the middle. The flowers are of a cream colour: and are ſucceeded by large oval fruit, covered by a browniſh ſkin, incloſing a thick pulp of a ruſſet colour, very luſcious, and called *natural marmalade*, from its reſemblance to that of quinces. The ſtones taken in emulſion are reckoned good again the gravel.

Achras sapota, with oblong oval leaves, and ſmooth turbinated fruit. It is common about Panama, and ſome places in the Spaniſh Weſt-Indies; but is not to be found in the United States, or in any of the Britiſh ſettlements in North America.

ACHROI, perſons who have loſt their natural colour; ſuch as have the jaundice.

ACHROMATIC, an epithet expreſſing want of colour.

Achromatic telescopes, are teleſcopes contrived to remedy the abberations in colours. A particular account of the invention and conſtruction of theſe inſtruments will be found under Optics.

ACHSHAPH, a city, originnally a kingdom, near the foot of mount Tabor, taken by Joſhua, and given to the tribe of Aſher. In St. Jerome's time, it was reduced to a ſmall village, and called Chaſalus.

ACATELING, a meaſure for liquids uſed in Germany, 32 achtelings make a heemer; four ſciltims or ſciktins make an achteling.

ACHTENDEELING, a meaſure for grain, uſed in ſome parts of Holland.

ACHY, a ſpecies of Caſſia, that grows in Arabia.

ACHYER, a ſtrong town and caſtle of the Ukrain, ſubject to the Ruſſians ſince 1667. It ſtands on the river Uorſklo near the frontiers of Ruſſia, 127 miles E. of Kiow, Long. 111. 10. E. Lat. 49. 32. N.

ACHYRANTHUS, in botany, a genus of the pentandria order, belonging to the monogynia claſs of plants, and aſſociating with the Miſcellaneæ, in the 34th Natural Order. The characters are: The calyx is a double perianthium: the exterior one conſiſting of three lanced acute leaves, alſo perſiſtent. No corolla: The nectarium is five-valved, ſurrounding the germen, bearded at the top, concave, and falling off. The ſtamina conſiſts of five filaments the length of the corolla; the antheræ are ovate and incumbent. The piſtillum has a top ſhaped germen; the ſtylus is filiform, and the length of the ſtamina; the ſtigma is villous, and divided into two ſegments. The perianthium is a roundiſh one-celled capſule, not gaping. The ſeed is ſingle and oblong. Of this genus eight ſpecies are enumerated; but the character of the genus do not agree in them all. They are all natives of the Indies. Only one of them, the amaranthus, is commonly cultivated in botanical gardens, and that more for the ſake of variety than beauty. It grows to the height of three feet, with oblong pointed leaves. The flowers come out in long ſpikes from the extremities of the branches and appear in July, the ſeeds ripening in September. Plants of this kind muſt be reared in a hot-bed, and may be tranſplanted when they have required ſufficient ſtrength. If kept in pots, and ſheltered during the winter in a warm green-houſe, they will live two or three years.

ACHYRONIA, in botany, a name given by Van Royen, to a genus of plants of the papilion aceous kind, called by Linnæus Aſpalathus.

ACHYROPHORUS, in botany, the name of a genus of plants of the ſame characters with the Hypochæris.

ACIA, a term in the Roman Surgery, concerning the meaning of which the phyſicians, and commentators are much divided. Celſus, ſpeaking of the healing of wounds either by ſuture, or the fibula, ſays, each is beſt effected by means of a ſoft *acia*, not too much twiſted, that it may fit the eaſier on the body. Boxhornius will have the acia to be the *acus* of the fibula, or that part which is pinched: In which view *acia mollis* only imported, that it was not ſet, ſo as to pinch too much.

ACICANTHERA, in botany, the trivial name of a ſpecies of Rhexia, which ſee.

ACICOSA, an herb that grows in Peru, and is ſomtimes uſed inſtead of the herb paraguay, of which it is ſaid to have all the properties.

ACICULÆ, the ſmall pikes or prickles of the hedgehog, echinus marinus, &c.

ACID, ſair, ſharp.

ACIDALUS, a fountain in Orchomenus, a city of Bœotia in which the Graces are ſaid to have bathed.

ACID Basis, in chemiſtry, the ſimple ſubſtance whith which the acidifying principle combines, to form an acid.—See Acids.

ACIDIFIABLE, that which is capable of producing an acid.

To ACIDIFY, to convert any ſubſtance into an acid.

ACCIDIFYING principle, that principle, ſuppoſed to exiſt in the air, which converts other ſubſtances into acids. M. Lavoiſier

M. Lavoiſier ſuppoſes it to be DEPHLOGISTICATED air, while Mr. Kirwin contends that it is FIXED air. See Acids.

ACIDS derive their name from the Latin word *acere*, to be ſharp; which expreſſes one quality by which they are diſtinguiſhed, viz. their ſour taſte. They form one of the general claſſes, into which ſimple ſalts are divided, and are the moſt ſimple of all ſaline ſubſtances. If they were ſeparated from water, to which they have a ſtrong affinity and from all other ſubſtances not neceſſary to their ſaline eſſence they would appear under a concrete or ſolid form; but the contact of the air, which is loaded with watery vapours, is ſufficient to diſſolve them, and therefore they are always in a fluid ſtate. On this account, it is not eaſy to aſcertain the quantity of acid in acid liquors. Homberg made ſeveral experiments to this purpoſe, by combining acid liquors with ſalt of tartar, ſo as to form neutral ſalts; imagining that the weight gained by this alkali from its union with acids, or the difference between the weight of the ſalt of tartar and the neutral ſalt produced, was equal to the weight of real acid contained in the quantity of acid liquor employed. But as he did not conſider that the air expelled from ſalt of tartar, during its combination with acids, makes a very conſiderable part of the weight of that alkali, the inferences from his experiments are not juſt; and the real quantity of acid, contained in an acid liquor, is ſo much more than the quantity inferred by him, as the whole weight of the fixed air diſengaged from the ſalt of tartar. Acid ſalts are all found to be volatile; by which they are diſtinguiſhed from the reſt, which are either fixed, or have an urinous inſtead of an acid taſte. Some chemical philoſophers have even made it very probable that it is the acid, which is the ſaline part, or principle, in all ſalts. They conſider it as a ſubtle penetrating ſubſtance, diffuſed through the ſeveral parts of the globe; which, according to the different matters it happens to be united with, produces different kinds of bodies. Of this ſentiment is Sir Iſaac Newton. "In compounding ſulphur, ſays that author, we get an acid ſalt of the ſame nature with oil of ſulphur *per campanum;* which ſame acid, abounding in the bowels of the earth, unites ſometimes with the earth, and thus makes alum; ſometimes with earth and bitumen, and thus compounds ſulphur." In reality, all our native ſalts, though without any mixture from art, are yet found to be real mixtures; and their compoſition and decompoſition are eaſily made.

Acids poſſeſs ſeveral common properties, beſides the ſharpneſs of ſourneſs or their taſte. They are readily united with water; and from this union a new compound fluid is formed, whoſe ſpecific gravity differs from the main gravity of its component parts. They may be likewiſe combined with ſpirits of wine and form a volatile ſubſtance, which chemiſts have denominated *aether*. They may be alſo combined with abſorbent earths, with alkaline ſalts, with metalic ſubſtances, with phlogiſton, and with oils; and in the proceſs of uniting them, diſcharge all or part of the fixed air which they contain. The combination with alkaline ſubſtances occaſions a violent efferveſcence, and produces neutral ſalts. They diſſolve the aſhes of vegetables, and the ſolid parts of animals. All ſolutions, the metallic ones excepted, deſtroy the acrimony of the diſſolving *acid*, and the menſtruum loſes its diſſolving power. Acids, likewiſe, for the moſt part, agree in changing into red the blue colours of vegetable juices, and in heightening the colour of thoſe that are red. But this property is not common to all acids; for the volatile ſulphureous acid deſtroys theſe colours. Nor is it peculiar to acids; for alum, a neutral ſalt, produces the ſame effect. Acids reſiſt fermentation; they are not ſo eaſily frozen as water, and they generate cold, when poured upon ice. M. Homberg explains the actions of acids on alkalies, and accounts for the great number of little bubbles, and the heat produced thereby, by ſuppoſing the acids to be little ſolid pointed bodies, and the alkalies to be ſpongeous porous bodies, formerly filled with the points of acids, and ready to receive the like again; and that the matter of light, (which he took to be the chemical principle, ſulphur, and to poſſeſs the whole extent of the univerſe,) by acting upon thoſe ſolid acids, while floating in the ſame liquor with the ſpongeous alkalies, impels the ferment to enter the cavities of the latter, and thus produces ſuch a degree of friction, as to occaſion that efferveſcence and heat, which we ſee is the conſequence of their mixture; and that the air which filled the pores of the alkalies, being thus expelled, occaſions the ebullition that ariſes from it. Sir Iſaac Newton accounts for the effects by the principles of attraction. See Affinity.

As to the Nature of acids in general, various opinions have been formed, and theories adopted, by the philoſophers of the preſent age reſpecting the Nature of Acids.—Some ſuppoſe them to be compounds of water and earth; others maintain, that they are ſimple chemical enemies; while a third claſs reſpect both thoſe theories as untenable, and contend, that the acid principle is contained in the air. M. Lavoiſier, the celebrated French chemiſt, is at the head of this laſt claſs, in which he is followed by the French chemiſts in general, who, with him inſiſt that this principle forms acids of various powers and denominations, according as it unites itſelf with different ſubſtances. M. Lavoiſier has endeavoured to eſtabliſhed this theory by numerous and repeated experimrnts; from the whole of which he concludes, that dephlogiſticated air is a conſtituent part of all acids, but more eſpecially of the nitrous, the phoſporic and the vitriolic. To this air, therefore, in its fixed ſtate, he gives the title of *oxygenous* or *acidifying* principle; and ſhows, that it not only produces dephlogiſticated air, when combined with fire, heat, or light, but that it alſo forms fixed air when united with charcoal or any phlogiſtic ſubſtance; that it produces the nitrous acid, when combined with nitrous air; the vitriolic, when united with ſulphur; the ſaccharine, when combined with ſugar, and the phoſphoric, when united with Knuckel's phoſphorus, &c. M. Kirwan agrees with M. Lavoiſier in the general principle, that "dephlogiſticated air becomes an eſſential conſtituent part of acids," but diſputes M. Lavoiſier's opinion that "nitrous air is a conſtituent part of the nitrous acid," as well as M. de Morveau's doctrine reſpecting the compoſition of acids; and inſiſts, that "*fixed air* and not dephlogiſticated air, is the acid principle." In proof of this theory, M. Kirwan produces a veriety of experiments, both of his own and Dr. Prieſtley's from all of which he draws this inference, that "as fixed air *alone* can be extracted from all vegetable acids, it ſeems to be the true acidifiable principle." Meſſrs. Watt and Cavendiſh, however, have made a number of experiments proving the contrary doctrine; for all which we muſt refer our chemical readers to the works of theſe learned authors.

Acids differ conſiderably from each other with regard to their ſtrength, their ſolvent power, and the changes produced in them by the bodies on which they act. Acids ſeem, from their univerſality, to be of the greateſt uſe in the œconomy of the world. The air, earth, and ſea, abound with them. It is obſerved, that the air is moſt replete with acid, when the wind blows from the north and eaſt, and when the weather is ſerene; a fact which according to Hoffman, is confirmed by the obſervations of thoſe who are concerned in nitre works: from whence we may conclude, that the *aerial acid* is inſtrumental to the production of cold in the air. The analogy between *acids* and *cold*, and between alkalies and heat, is very remarkable. *Heat* and alkalies promote the putrefaction of dead bodies; or, in other words, deſtroy the coheſion of their parts: on the contrary, *acids* and *cold* preſerve them from putrefaction, by preſerving the coheſion of their component parts.

Acids are diſtributed into three general claſſes, according to the ſubſtances from which they are extracted; viz. animal, mineral, and vegetable acids. Nevertheleſs, it is the opinion of Stahl, and of other eminent chemiſts, that there is but one primitive acid; and that all the other acids are only different modifications or combinations of it. This opinion ſeems to be confirmed by the experiments above-mentioned of Meſſrs. Lavoiſier and Kirwan, who both agree that the acid principle exiſts in the air, though they differ with regard to *what* it is—the former ſuppoſing it to be *dephlogiſticated* and the latter *fixed air*. See Aerology. We now proceed to give a brief account of the different acids, not in their chemical, but in the lexicographical, or alphabetical order.

Acid Aerial, a name given by Mr. Bergman of Upſal, to fixed air, becauſe he found that this ſpecies of air had an acid quality, by its changing the blue juice of tourneſole into red: and the fact was farther verified by Mr. Hey, and Mr. Bewley; the latter of whom has proved, by a ſeries of experiments, that fixed air does not owe its acidity entirely to the nature of the ſubſtances from which it is extracted, as Sig. Landriani, and ſome foreign philoſophers, imagine; but that it is an original acid *ſui generis*, expelled from the ſubſtances, with which it is combined, by the force of fire, or by the power of a ſuperior acid; but Dr. Prieſtley rather apprehends, that it is a modification of the nitrous acid. This acid, which Mr. Kirwan ſuppoſes to be the acid principle, is alſo called fixed air, and the cretaceous acid. See Air.

Acid of Amber is ſuppoſed by Dr. Monro to be an *acid ſui generis*, and extracted from ſalt of amber. It is a mineral acid. See Amber.

Acids, Animal, one of the three great diviſions of acids, which have been diſcovered in certain animal ſubſtances; as butter, fat, blood, ants, flies, &c. M. Homberg firſt aſcertained the exiſtence of a latent *animal acid*, and he has propoſed two ways of procuring it. One way is, by concentrating the phlegm which ariſes firſt in the common diſtillation of animal ſubſtances for their volatile ſalt and oil. The reſiduum of this phlegmatic liquor, when it has been rediſtilled with a gentle heat, till only a ſmall portion is left, will yield an acid; which he has ſometimes concentrated ſo far, that it ſeemed to be as ſtrong as common vinegar. The other method of collecting this acid is, by mixing earthy matters with the animal ſubject at firſt, and urging the diſtillation after all the alkaline ſalt and oil have ariſen. The acid is at length forced out by the great vehemence of fire. Whether this acid be any other than part of the vegetable acid derived from plants in the ordinary way of food and nutrition, or of the acid of the marine ſalt, which animal ſubſtances poſſeſs, muſt be determined by future experiments and obſervations. But it is certain that they differ in the ſame circumſtances as the vegetable acids do from mineral acids. Dr. Hooke has long ſince obſerved, that inſects which are furniſhed with ſtings, as bees, waſps, and hornets, diſcharge, when irritated, an acid juice; but none yield ſo large a quantity as ants. Ants in their *chryſalis*, or maggot ſtate, have no acid; but if a ſtick be thruſt into an ant hill, they will diſcharge a fluid, which has an acid taſte and ſmell; and which will make the blue flowers of ſuccory, borrage, &c. red. And this acid obtained, either by diſtillation, or by throwing the living animals into the water, till it is ſufficiently impregnated with it, will, with lead, make a peculiar ſort of *ſaccharum ſaturni*, which on diſtillation will give back the acid in its own form again. M. Margraaf has demonſtrated, by ſome late experiments, that it bears no analogy either to the marine or vitriolic acid; becauſe it does not precipitate ſilver, lead, or mercury, from the nitrous acid, nor quick lime from the marine. He concludes upon the whole, that this *acid* much reſembles that of vinegar, though in ſome reſpects it is different. The animal acids are, the acids of ants, bees, bones, blood, butter, milk, ſilk worms, waſps, &c. to which ſome add the human calculus.

Acid of Ants, an animal acid, produced by diſtilling millions of theſe inſects, either with water, or without any addition. It reſembles vinegar in many reſpects, but differs from it in forming chryſtals with magneſia, iron, and zinc.

Acid of Arsenic, a mineral acid, produced from Arsenic, which ſee. Notwithſtanding its being ranked among acids, it has no ſour taſte. In a ſtrong heat it will expel the acid of vitriol.

Acid of Bones. See Acid Phosphoric.

Acid of Borax, a mineral acid, which reſiſts the fire and melts into a kind of glaſs. See Borax.

Acid, Cretaceous, [from *Creta*, chalk, becauſe it is found in great quantity in that ſubſtance,] Fixed Air, or the Aerial Acid, which ſee.

Acids, Concrete, are ſaline ſolid ſubſtances, which have the properties of acids; ſuch as cryſtals of tartar, eſſential ſalts of vegetables, the volatile acid ſalt of amber, and of ſome other bituments, and the flowers of benjamin, &c.

Acid Fluor, is a mineral acid, ſo called from the name which the chemiſts have given to the ſubſtance from which it is extracted. This ſubſtance is of the ſame kind with the Derbyſhire ſpar. The acid is expelled from it by oil of vitriol; and as it was diſcovered by Mr. Scheele, a Swede, it is often diſtinguiſhed by the name of the Swediſh acid. Mr. Scheele ſuppoſed, that acid and water were the conſtituent parts of the foſſil from which it was produced. Mr. Boulanger apprehends, that this acid is only the acid of ſalt combined with an earthly ſubſtance. But Dr. Prieſtley, in the reſult of his experiments, has proved, that the fluor acid is the acid of vitriol, charged with ſo much phlogiſton as is neceſſary to its taking the form of air, and alſo with much of the earthy matter of the ſpar. Fluor acids ſometimes denote thoſe acids, which are always in a fluid ſtate; ſuch as the volatile, vitriolic, nitrous and marine acids, and thoſe which are obtained by diſtillation from vegetable and animal ſubſtances.

Acid Lithiasic, the name given by chemiſts to that peculiar acid, of which the human calculus, or ſtone in the bladder, is ſaid to be chiefly formed.

Acid Marine, is one of the three mineral acids; ſo called, becauſe it is generally obtained from ſea ſalt; though it may be likewiſe extracted from ſal gem, or foſſile ſalts, and from the ſalt of ſaline fountains and pits. This acid is ſtronger than any of thoſe of the vegetable and animal kingdom; but weaker than the vitriolic or the nitrous. It is never found pure, but always combined with an alkali, ſo as to form a neutral ſalt. As it is more volatile than the other mineral acids, it cannot be ſo eaſily combined with phlogiſton, though many facts ſufficiently aſcertain the practicability of ſuch a combination. This ſpecies of acid is ſuppoſed by the chemiſts to be an offspring of the vitriolic acid, and to conſiſt of this acid combined with an inflammable and a mercurial principle. Becher aſcribes its peculiar properties to a principle, which he calls mercurial earth; but Stahl rejects this part of his theory; and expreſſes a wiſh, that the exiſtence of the mercurial earth could be as well aſcertained as the exiſtence of phlogiſton. The marine acid eaſily diſſolves zinc, iron, and copper; it acts with great difficulty on tin, and ſcarcely acts at all in its liquid ſtate on ſilver, mercury, lead, or regulus of antimony. It diſſolves gold by the help of the nitrous acid; and by a modern diſcovery, gold and platina are rendered ſoluble in this menſtruum, either by previous ſolution in aqua regia, and precipitation from that menſtruum, by means of an alkali, or by a previous calcination with tin and other imperfect metals. Some of the moſt remarkable phenomena, attending the combination of marine acid with metalic ſubſtances, are the following: It diſſolves theſe ſubſtances with leſs heat and efferveſcence, and with fewer vapours than nitrous acid does. If forms, with all the metals, which it diſſolves, excepting iron and copper, ſalts capable of cryſtallization. The metals with which it contracts the ſtrongeſt union are thoſe to which it unites with the greateſt difficulty. Marine acid volatizes, either wholly or in part, the metals with which it is united; and forms with thoſe metalic ſubſtances to which it moſt firmly adheres, ſuch as mercury, regulus of antimony, ſilver, and lead, metalic ſalts, much more corroſive than thoſe formed by the vitriolic or nitrous acid. Homberg indeed found, that marine acid of itſelf corrodes glaſs more than any other acid. This acid can only be obtained by means of an intermediate ſubſtance ſufficiently powerful to diſengage it from the native fixed alkali, which is the baſis of common ſalt. Vitriolic acid is the moſt proper for this purpoſe. The chemiſts of the preſent age differ much with regard to the principles of this acid. Mr. Kirwan ſays, "The marine acid conſiſts of a peculiar baſis united to phlogiſton, and a certain quantity of fixed air; to both of which the baſis ſeems to have a ſtrong affinity. On depriving it of this phlogiſton, the affinity of the acid to fixed air becomes much ſtronger, and it ſaturates itſelf ſo largely with it, that its attractions for other ſubſtances, containing little or no phlogiſton, become nearly as weak as thoſe of fixed air itſelf when equally condenſed; but with reſpect to bodies that contain a conſiderable quantity of phlogiſton, its affinities are much ſtronger, as its baſis attracts the phlogiſton, while theſe bodies attract its exceſs of the fixed air. In this ſtate it does not expel fixed air from aerated fixed alkalies or earth, until it is heated; and then dephlogiſticated air ſeparates from it, and it becomes in all reſpects, common marine acid. For as it contains an exceſs of fixed air, it acts nearly as an acid of the ſame nature; but when heat is applied, its baſis dephlogiſticates its own fixed air, which then becomes dephlogiſticated air, at the ſame time that the acid becomes common marine acid, and acts as ſuch." M. Lavoiſier, and other philoſophers, who deny the exiſtence of phlogiſton, are of opinion, that the common marine acid conſiſts of a peculiar baſis, united to a ſmall proportion of pure air, or oxygenous principle, and the dephlogiſticated marine acid differs from it only by containing an exceſs of this principle.—This opinion they are chiefly induced to maintain, becauſe the acid, in its dephlogiſticated ſtate, is procured by diſtilling common marine acid from manganeſe; and the manganeſe, if diſtilled by itſelf, before the acid is diſtilled from it, affords dephlogiſticated air; but after the acid is diſtilled from it, it yields none—"This experiment, however, (ſays Mr. Kirwan,) proves no more, but that the maganeſe contains ſome air, which is dephlogiſticated during the calcination. And that this air is fixed air, appears from the following conſiderations: The black calx of maganeſe almoſt always gives out fixed air at firſt, before any dephlogiſticated air appears; whence it is natural to think, that the dephlogiſticated air proceeds from the deghlogiſtication of the fixed air. And hence, if it be diſtilled with filings of iron, or in a gun-barrel, it ſcarce gives out any other than fixed air; if at any time it gives out dephlogiſticated air, with little or no mixture of fixed air, this is owing to a very perfect dephlogiſtication of the calx, and to its containing very little moiſture. Thus Dr. Prieſtley having paſſed the ſteam of boiling water through manganeſe heated in an earthern tube, obtained a very large quantity of fixed air, and ſcarce any other; though on repeating this experiment with manganeſe well freed from calcareous earth, I obtained a large portion of dephlogiſticated air; but I believe much depends on the degree of heat to which the tube is ſubjected. But having diſtilled manganeſe, which yielded of itſelf ſome fixed air, with common ſpirit of ſalt, I obtained dephlogiſticated marine acid, and not a particle of fixed air; which ſhows that this laſt combined with the dephlogiſticated baſis, and formed the dephlogiſticated acid.—Mr. Hermſtadt having diſſolved the black calx in common marine acid, and precipitated it with an aerated fixed alkali, obtained as uſual, a white precipitate; which, when heated, afforded a great part of the fixed air it had abſorbed from the alkali; but when heated to ſuch a degree as to be of a brown red colour, and conſequently dephlogiſticated, it converted common ſpirit of ſalt into a dephlogiſticated acid, which could proceed only from ſome fixed air yet unexpelled: yet if ſal ammoniac be diſtilled with the black calx of manganeſe,

manganeſe, it will be expelled in a cauſtic ſtate; for the fixed air unites to the dephlogiſticated marine baſis in preference to the volatile alkali." The following experiment, Mr. Kirwan is of opinion, fully confirms this opinion, fully confirms this hypotheſis, and ſubverts that of the antiphlogiſtians. "Six cubic inches of inflamable air were mixed with as much dephlogiſticated marine air over lime-water. In about 10 minutes after the greater part of the diminution had taken place, a white cloud appeared on the ſuface of the lime-water, and by agitation it ſtill became more turbid. As it was poſſible that the manganeſe might be mixed with calcareous earth, ſome dephlogeſticated marine air was extracted from another portion of it, and received on lime-water; but it was wholly abſorbed, without forming the leaſt cloud, though there was lime enough; for, on adding aerated water, a cloud appeared."

ACID, MICROSMIC, an animal acid, otherwiſe called, PHOSPHORIC, which ſee.

ACIDS, MINERAL, are one of the three general claſſes into which acids are diſtributed. They derive their name from the mineral ſubſtances from which they are procured; and they are ſubdivided into the marine, nitrous, and vitriolic acids. With reſpect to their general character, they are more ſimple, leſs volatile, more ſuſceptible of concentration, and ſtronger than the acids obtained from animals or vegetables. This claſs of acids comprehends the acids of amber, arſenic, borax, molybdæna, nitre, ſea ſalt, tungſten, vitriol, &c. of which theſe three, the nitrous, marine, and vitriolic, are not only the ſtrongeſt of this claſs, but the moſt powerful of all acids; that is, if any other acid be united to an alkali, earth, or metal, the union will be broken by adding to that compound any of theſe three acids. Neither are theſe equal in power among themſelves; for the vitriolic is ſtronger than the nitrous, and the nitrous ſtronger than the marine. The rule, however, is liable to exceptions and variations, depending on the circumſtances of heat or cold, moiſture or dryneſs, and particularly on the ſtate of the marine acid, being in the form of an aqueous fluid, or reduced to a dry vapour. In this laſt caſe it ſeems ſtronger than either the vitriolic or nitrous; and even when in an aqueous ſtate, both the nitrous and marine acids, when added in great quantity, ſeem to oppreſs and overwhelm the ſtronger vitriolic acid, ſo that they will partly expel it from an alkaline ſalt. This does not depend on the mere quantity of acidity they poſſeſs: for the acetous acid may be concentrated to ſuch a degre as to become ſtronger in this reſpect than ſpirit of ſalt; yet it will always be inferior in point of real ſtrength, when tried with an alkali in competition with the latter.

ACID OF MOLYBDÆNA, a new acid lately diſcovered by Mr. Scheele, which, however, has hardly accidity in the taſte. See MOLYBDÆNA.

ACID, MURIATIC. See ACID, MARINE.

ACID, NITROUS one of the three moſt powerful mineral acids, although it is the moſt limited. It is ſeldom met with in any combination, but in the neutral ſalt, from which is derives its name. The concentrated nitrous acid is weaker and much more volatile than the vitriolic. In this ſtate it ſtrongly attracts the moiſture of the air, and when mixed with water, occaſions a great heat and ebullition. M. Beaume obſerves, that while they are mixing, the liquor aſſumes a blue or deep green colour, though the vapours at the ſame time retain their original yellowiſh red. It fulminates, when ignited, on the contact of any imflammable matter; and burſts into flame, when mixed with diſtilled and expreſſed oils. It is of a yellowiſh red flame colour, emits vapours of the ſame colour, and poſſeſſes a peculiar taſte and ſmell. The nitrous acid contains phlogiſtion, and yet takes it with avidity from other ſubſtances. By means of this property, the ſubſtances into which it enters, burn without the aſſiſtance of common air. This acid is one of the moſt powerfnl menſtruums in chemiſtry, not that it is ſtronger than either the vitriolic or marine; but on account of the facility, quickneſs and activity, with which it diſſolves moſt ſubſtances. It corrodes and diſſolves all metallic bodies, except gold and platina; and Dr. Brandt has found, that by particular management it can diſſolve gold. But its action is moſt vehement on thoſe metals which contain moſt inflammable matter, as zinc and iron.

This acid combined with fixed vegetable alkali forms nitre; with marine or foſſil alkali, it forms a neutral ſalt, with ſhoots into cubical cryſtals, hence called *nitrum cubicum;* with volatile alkali, it produces the nitrous *sal ammoniacum.* Nitrous acid quickly diſſolves all calcareous and abſorbent earths. It is eaſily combined with oils, and with ſpirit of wine. This acid, which is ſometimes called ſpirit of nitre, may be procured by mixing two parts of dry and powdered clay with one part of nitre, and diſtilling the compoſition in a reverberatory furnace, with a gradual heat. Clay is very proper for decompoſing nitre, becauſe it contains a vitriolic acid. Martial vitriol is uſed for producing ſmoaking ſpirit of nitre; and pure vitriolic acid is made uſe of in diſtilling Glauber's ſmoaking ſpirit of nitre. The formation of this acid has of late occaſioned no ſmall ſpeculation among chemiſts. The experiments of Mr. Cavendiſh, as well as of the French chemiſts, have however put it beyond all doubt, that it is produced during the deflagration of dephlogiſticated and inflammable air. Mr. Cavendiſh has ſhown that the nitrous acid may be formed by taking the electric ſpark in a mixture of 3 meaſures of dephlogiſticated air and 7 of dephlogiſticated air, or, in weight, one part of the former, and about 2.6 of the latter. Mr. Lavoiſier ſuppoſes the nitrous acid to be compoſed of nitrous air, united to the oxygenous principle; and 100 grains of dry nitrous acid to conſiſt of 64 grains of nitrous air, united to 36 of pure air, deprived of its ſpecific fire; or, according to Mr. Kirwan's calculation, 173 cubic inches of nitrous air and 105 of pure air. But nitrous air, as Mr. Lavoiſier has obſerved, is a compound; 100 grains of it, according to him, containing 32 of phlogiſticated and 68 of pure air; conſequently 64 grains of it contain 20.5 of phlogiſticated air, and 43.5 of pure air. Hence 100 grains of dry nitrous acid contain 79 and a half of pure air, and 20 and a half of phlogiſticated air. Mr. Kirwan is of opinion, that 100 grains of pure, dry, and colourleſs nitrous acid contain 38.17 grains of fixed air, as its acidifying principle, 57.06 of nitrous baſis, and 4.77 of phlogiſton united to the nitrous baſis. With regard to the nitrous baſis itſelf, he ſays, that one third of its weight is phlogiſticated and two thirds dephlogiſticated air, both in a concrete ſtate. "Nitrous baſis,

ſis, (ſays Mr. Kirwan,) ſaturated with phlogiſton, conſtitutes nitrous air : 100 grains of this baſis take up nearly 22 of phlogiſton. Hence the conſtituent principles of nitrous acid are fixed air, dephlogiſticated air, and inflammable air, all in their concrete ſtate."

"**RED, YELLOW, GREEN, and BLUE NITROUS ACIDS,** (continues he,) when thoſe colours are intenſe, owe their origin to the abſorption of nitrous air ; and conſequently the proportion of their principles is variable, though all have the dephlogiſticated acid for their ground. Thus Dr. Prieſtly having expoſed ſtrong pale yellow nitrous acid, whoſe ſpecific gravity could not be leſs than 1.400 to nitrous air, found that 100 grains of this acid abſorbed, in two days, 247 cubic inches of nitrous air : now, 100 grains of this ſpirit muſt have contained, by my calculation, about 21 grains of dry acid, aud theſe 21 grains took up 91.39 grains of nitrous air. When about 20 cubic inches of nitrous air were abſorbed, (that is, about 7 grains,) the acid became of an orange colour ; when 50 cubic inches were abſorbed (about 18 grains,) it became green ; and when nearly the whole was abſorbed, it evaporated in the form of nitrous vapour, carrying off part of the water with it. Hence we ſee that nitrous vapour conſiſts of nitrous acid united to three or four times its weight of nitrous air and a little water." This theory is further confirmed by reflecting on the manner in which nitrous acid is generated by nature, Mr. Thouvenel found that this acid is conſtantly produced when chalk is expoſed to a mixture of putrid air and common air, or putrid and dephlogiſticated air ; but if the putrid air be paſſed through lime-water it is never generated ; and that it is rarely produced by the expoſure of quicklime or fixed alkalies to theſe airs. The reaſon that alkalis, though aerated, are not ſo proper, is, that they do not combine with phlogiſticated air, as calcareous earths do.

ACID, OXYGENATED, MURIATIC, or DEPHLOGISTICATED MARINE ACID. This is a new acid, for the diſcovery of which, the lovers of chemiſtry are indebted to Mr. Scheele, as well as for that of the effects it produces upon the colours of vegetables. "It is in its elaſtic ſtate, ſays that great philoſopher, that the qualities of this air are beſt diſcovered. In a ſand bath is to be placed a glaſs retort, in which muriatic acid has been poured upon manganeſe ; to this ſmall receivers are to be adapted, capable of containing about twelve ounces each, into which are to be poured about two drams of water, without any other lute than a ſlip of blotting paper about the neck of the retort. In about a quarter of an hour, a yellow air is perceived in the receiver, which is to be taken off. If the paper has been properly applied, the air ruſhes out forcibly ; the receiver muſt be quickly ſtopped, and another applied. Thus many receivers may be filled with the dephlogiſticated muriatic acid ; but it is neceſſary to place the retort in ſuch a manner, that the drops which riſe into its neck may be able to fall back.—The water ſerves to retain the vapours of the acid. I uſe many receivers that I may not be obliged to repeat a ſimilar diſtillation for every experiment. It is not proper to employ large ones, becauſe, every time they are opened, a great part of the acid is diſſipated in the air. What I ſubmitted to examination with this dephlogiſticated muriatic acid was placed in the neck of the receiver, which I had ſtopped. The cork was turned yellow, as by aqua fortis. Paper tinged with turnſole became almoſt white ; all read, blue, and yellow, flowers, as alſo green plants, turned yellow in a ſhort time, and the water in the receiver was changed into a pure weak muriatic acid ; and neither alkalies nor acids were able to reſtore their colours."—I took up the experiments of Scheele, ſays Mr. Berthollet, aud I attempted to throw more light on the nature of the oxygenated muriatic acid, and upon its principal properties. I have ſhewn that one portion of the muriatic acid diſſolved the calx of manganeſe, and ſeparated a part of the baſe of vital air, or oxygene, (which was in exceſs in the calx of manganeſe,) that the diſſolution might be performed ; that this oxygene, being in a non-elaſtic ſtate, or, according to the expreſſion of Dr. Prieſtly, in a naſcent one, and therefore very much diſpoſed to form new combinations, unites itſelf with another portion of the muriatic acid, and that this combination conſtitutes the oxygenated muriatic acid gas.—According to Scheele, "The muriatic acid deprived of phlogiſtion, which is one of its conſtituted parts, does not unite with water but in a very ſmall quantity, and does not render it very acid." He appears to have contented himſelf with examining the water, which had not been in contact with the gas, except during the time of the operation, and to have concluded therefrom, that the gas was very ſlightly ſoluble therein ; ſo that it appeared to him better to employ the gas itſelf, in his experiments, than the water, which would be but weakly impregnated ; and which at the ſame time would contain a ſmall quantity of muriatic acid, which comes over in the diſtillation, when the neceſſary precautions are not taken to retain it by an immediate bottle.—The firſt object which I propoſed to myſelf was to examine the ſolubility of the oxygenated muriatic acid gas in water, becauſe I imagined, that, if I was able to obtain a ſlightly concentrated ſolution, it might be more eaſy to ſubmit this liquor to different experiments than the gas itſelf. I ſoon perceived that this gas diſſolved in water more readily, and in greater quantity, than carbonic acid gas, or fixed air ; and that the water which was ſaturated with it acquired a very ſtrong odour, a yellowiſh colour, and other properties very ſtrongly marked. I had made my firſt trials by agitating water in contact with the gas, in the manner in which water is generally impregnated with fixed air ; but the ſuffocating vapour which exhaled determined to employ Mr. Woulfe's apparatus, inſtead of that proceſs. I placed, between the retort and the bottles filled with water, (deſigned to be impregnated with the gas,) a ſmall bottle, which I ſurrounded with ice, to condenſe the muriatic vapour which was not oxygenated : I alſo ſurrounded with ice the bottles filled with water. I obſerved during this operation, that, when the water became ſaturated with the gas, this laſt took a concrete form, and fell ſlowly to the bottom of the water.—If there is filled with water, impregnated with the gas that is diſengaged, (that is to ſay, with oxygenated muriatic acid,) a bottle having a long tube bent and plunged under a recipient filled with water, and this bottle is expoſed to the light of the ſun, bubbles are ſoon obſerved to be diſengaged, which paſs into the recipient, and which are of pure air (vital air, or oxygene gas ;) when the bubbles ceaſe to be diſengaged, the liquor has loſt its odour, its colour, and all its diſtinguiſhing properties ; it is then no other than water impregnated with common muriatic acid.

ner;—Finding that raw ſilk expoſed to the action of light, produced ſo great a quantity of air, he was induced to try ſome other ſubſtances. Having therefore prepared 6 globes 4 inches and a half diameter, and filled them with ſpring water, he introduced into each of them 15 grains of one of the following ſubſtances, *viz.* ſheep's wool, eider-down, fur of a Ruſſian hare, cotton wool, lint, or the ravelings of linen yarn, and human hair. The reſults of theſe experiments were various, though all yielded more or leſs of pure air. The wool, even in the moſt favourable circumſtances, never afforded more than one-third of the quantity which would have been yielded by ſilk. The eider-down began to furniſh air almoſt immediately, and continued to do ſo in quantities little leſs than had been furniſhed by the ſilk, and nearly of the ſame quality. The fur of the hare produced more air than the wool, but leſs than the eider-down. The cotton yielded a conſiderable quantity of air of a better quality than any of the former. The ravelings of linen were very ſlow in furniſhing air, and produced but a ſmall quantity; only two cubic inches being collected in the ſpace of a fortnight. This ſubſtance appeared to be the very reverſe of the hare's fur; for the air, inſtead of attaching and collecting itſelf about the ſubſtance in large bubbles, ſcarce ever made its appearance in ſufficient quantity to raiſe it to the top of the water. The human hair furniſhed ſtill leſs than the linen, and the produce was of inferior quality, though ſtill ſuperior to the common atmoſphere. In order to diſcover the comparative purity of the air produced from vegetables and from raw ſilk, a ſmall quantity of air from the ſtem of a pea plant, which had four healthy leaves upon it, was proved with nitrous air, and found greatly inferior to that from raw ſilk, and ſeveral of the ſubſtances already mentioned. An entire plant of houſe-wort, of a moderate ſize, furniſhed only 3 fourths of a cubic inch of air in ſeven hours, and that greatly inferior to common air; but the leaves alone afforded a much greater quantity, and of a quality greatly ſuperior.

To aſcertain how much air would be yielded by expoſure to the ſun's rays, a globe containing 296 inches, filled with freſh ſpring water, and 30 grains of raw ſilk, was expoſed to the air for 3 days in the month of May, but for the moſt part cold and cloudy. Only 9 inches and a half of air were produced; but next day, by expoſure to the ſun from 9 in the morning till 5 in the afternoon, 8.46 inches more were produced. Next day, the product of air was 9 cubic inches, of a better quality; and the day following, 6 inches ſtill ſuperior though expoſed only for 3 hours and a half; but the next daw, it being cold and cloudy, only 3 fourths of an inch of air were produced, and theſe manifeſtly inferior to the foregoing. No more air could afterwards be procured, except one quarter of a cubic inch; ſo that from 296 inches of this water, 33.96 of air were obtained. In this experiment, the air was every day removed, and its place ſupplied with water: the following was made, to determine what alteration would take place on allowing the quantity of air produced to remain from firſt to laſt. The globe being therefore filled again, and the ſilk well waſhed and replaced in it the quantity of air produced amounted in 4 days to 30.1 cubic inches; and would probably have been ſtill more conſiderable, had the globe been able to contain it along with the water. On employing unwaſhed raw ſilk, Sir Benjamin found that 17 grains in 20 cubic inches of water, produced for the firſt 4 days, are of a worſe quality than the atmoſphere; but afterwards yielded near 2 inches of a ſuperior quality. The quantity of this air was ſuperior to that in other experiments, though its quality was ſomewhat inferior.

Theſe reſults led Sir Benjamin to make trial of the cotton-like ſubſtance yielded by the *populus nigra.* 120 grains of this in 296 inches of water, during the firſt 4 days gave a very inconſiderable quantity of air, and that in a phlogiſticated ſtate. On becoming ſuddenly greeniſh, however, it yielded in 6 days 44 cubic inches and a half of purer air than had been before produced. Suſpecting that the quantity of pure air might depend on the comparative quantity of ſurface, he examined a hair of ſilk and one of poplar cotton, with a microſcope, and found the ſurfaces to be as 1000 to 3468. Whilſt 50 grains of the cotton preſented a ſurface of 6600 ſquare inches, the like quantity of ſilk exhibited no more than 476. Hence the produce of air from the 2 ſubſtances was neither in proportion to their weights nor their ſurfaces. It appeared alſo, that the quality of the air produced at firſt, was conſiderably inferior to that yielded ſome time afterwards. In order to aſcertain the times at which air of the beſt quality was produced, &c. ſeveral experiments were made. In ſome of them, the water had acquired a faint greeniſh caſt; but the colour of that with the cotton was deepeſt. On examining with a microſcope, it was found to contain a great number of animalcules, exceedingly ſmall, and nearly of an oval figure; that with the ſilk contained them likewiſe, but not in ſuch numbers: however, in all caſes in which the water acquired a greeniſh hue, they never failed to exiſt, ſo as to render it probable, that, from their preſence alone, the colour of the water in the firſt inſtance univerſally aroſe.

To determine what ſhare the ſubſtance employed had in producing air, and whether any other which preſented a large ſurface, and attracted air from water, would not do as well, the experiment was repeated with a quantity of ſpun glaſs, and the reſult was, that the globe being expoſed in the ſun, air bubbles began almoſt inſtantly to make their appearance on the ſurface, and in 4 hours, 0.77 of a cubic inch of air was procured; after which, not a ſingle globule more was produced, though the globe was expoſed for a whole week in ſunſhine weather. Hence it appears that ſomething more than mere ſurface was wanted to produce dephlogiſticated air from water by means of the ſun's light.

To determine the quantity and quality of air produced by means of the heat and light of the ſun from water alone, a large glaſs, containing 455 cubic inches, was filled with freſh ſpring water, inverted, and expoſed for 28 days. Another jar was alſo filled with water from a pond in which many aquatic plants were growing, and expoſed in the ſame way. The latter yielded air in pretty large quantities on the third day, and continued to do ſo till the 14th: the former little or none till the 14th, when it began to emit air, and continued to do ſo till the 22d. On removing the air produced, that from the ſpring water was 14 inches in quantity, and 128 in quality, (taking the quality of atmoſpheric air at 100;) but from the pond water 31½ in quantity, and 252 in quality. The colour of the water remaining unchanged, the thickneſs of the glaſs veſſel was thought an objection. The experiment was therefore repeated in a thin conical jar containing 344 inches, and expoſed 21 days to the ſun. Little air was furniſhed till the 7th day, when a fine ſlimy ſediment, of green matter beginning to be formed, air was furniſhed in pretty large quantities till the 18th, when it entirely ceaſed. The whole amounted to 40 cubic inches, and the quality 213.

The opinion of Dr. Ingenhouſz, that the dephlogiſticated air was *elaborated* in the veſſels of the plant, appeared exceedingly doubtful to the ingenious author of theſe experiments; for, beſides that many other ſubſtances, in which no elaboration takes place, cauſe the water to yield dephlogiſticated air as well as plants, and even in much greater quantities, and of a more eminent quality; the circumſtances of the leaves of a vegetable, which, accuſtomed to grow in air are ſeparated from its ſtem and confined in water, are ſo unnatural, that it is difficult to conceive they can perform the ſame functions in ſuch different ſituations. Freſh, healthy leaves furniſh air only for a ſhort time, and, after a day or two, change colour and ceaſe to yield any. This has been conceived to ariſe from the death of the plant; and from hence it has been inferred, with ſome degree of plauſibility, not only that the leaves actually retain their vegetative powers for ſome time after being ſeparated from their ſtock, but that it was in conſequence of the exertion of thoſe powers, that the air yielded in the experiment was produced. But tho' the leaves, expoſed in water to the action of light, actually do ceaſe to furniſh air after a certain time, yet they *regain* this power after a ſhort interval, when they furniſh, (or rather cauſe the water to furniſh) more and better air than at firſt; which can hardly be accounted for upon the ſuppoſition that the air is elaborated in the veſſels of the plant.

A confirmation of this doctrine has reſulted from various experiments; and thus we ſee, that nature is provided with abundant means of ſupplying that pure part of the atmoſphere, which is ſubject to continual waſte. No doubt the light of the ſun produces pure air from water as well as from vegetables, and even the water from the ocean contribute towards this ſalutary purpoſe. As dephlogiſticated air may poſſibly anſwer a valuable purpoſe in medicine, a cheap method of procuring it is ſuggeſted by Mr. Cavallo, who propoſed to diſtil it from nitre with a ſtrong heat; but the experiments already related point out an eaſier method.

2. *Properties of Dephlogisticated Air.*

This kind of air poſſeſſes ſome, though not all of the properties of common air. Thoſe in which it excels, are the ſupport of flame and of animal life. It is equally elaſtic, or rather more ſo than common air; as it likewiſe exceeds it a little in ſpecific gravity, the proportion betwixt it and common air, being that of 160 to 152. In dephlogiſticated air, the flame of a candle not only grows larger, but becomes exceedingly bright; and burns with a crackling noiſe, as if the air contained ſome combuſtible matter, at the ſame time that the wax or tallow waſtes ſurpriſingly faſt. The heat of the flame is in proportion to its light. If a bladder full of dephlogiſticated air be pricked with a pin, the ſtream of air will augment the heat of a candle to ſuch a degree, that if any ſmall bits of metal be placed on a piece of charcoal, and held in the apex of the flame, they will almoſt inſtantly be melted.

On mixing dephlogiſticated and inflammable air together, an exploſion takes place, as on mixing common and inflammable air, but with much greater violence. If an ounce vial, which for this purpoſe ſhould be very ſtrong, be filled with a little more than one third of dephlegiſticated, and the reſt inflammable air, and the flame of a candle preſented to its mouth, it will explode nearly as loud as a ſmall piſtol. All phlogiſtic proceſſes are promoted much better by dephlogiſticated than common air. Dr. Prieſtley put a ſmall quantity of pyrophorus into a ſmall jar, and threw in dephlogiſticated air. It always occaſioned a vehement aſcenſion, like the flaſhing of gun-powder, and the air was greatly diminiſhed.

It has been believed, in almoſt all ages, that combuſtion in every inſtance, diminiſhed common air, or reduced it to a ſmaller volume: but the late experiments of M. Lavoiſier have ſhown, that this is a miſtake; and that in ordinary proceſſes attended with the production of fixed and phlogiſticated air, the quantity of vapour produced is equivalent to that abſorbed, or otherwiſe made to diſappear during the operation. With dephlogiſticated air the caſe is very different. M. Lavoiſier having introduced a burning candle into a glaſs jar filled with very pure air, obtained from calcined mercury, a great heat took place: which at firſt expelled a ſmall quantity of the air; but afterwards, when the candle was extinguiſhed, it was found that two thirds of the bulk of air employed had been converted into fixed air, or a quantity of this kind of air equivalent to the former had been produced. The remainder, after taking up the fixed air by cauſtic alkali, was ſtill as pure as before. In the common proceſſes, he obſerves, that not more than 1 tenth of the air employed is converted into fixed air. In this experiment, the ſuperior gravity of the fixed air, and the conſequent condenſation of the other muſt have undoubtebly produced ſome diminution in the volume of air, though M. Lavoiſier does not take notice of it. In other caſes, however, the diminution is much more perceptible. M. Scheele having introduced a piece of phoſphorus into 7 ounces meaſures of this kind of air, ſtopped the mouth of the bottle, and ſet fire to the phoſphorus within: the vial broke in pieces, as ſoon as the flame was extinguiſhed, by the preſſure of the external air. A ſtronger vial being uſed, and opened afterwards under water, the fluid ruſhed into it in ſuch a manner as almoſt to fill it entirely. This extraordinary diminutiou was alſo demonſtrated by filling a matraſs with dephlogiſticated air, and inverting it over a vial containg an effervefcing mixture of vitriolic acid and iron filings plunged into a veſſel of hot water; and furniſhed with a ſlender tube reaching above the ſurface of the veſſel. The inflammable air iſſuing from the orifice of the ſmall tube, was ſet on fire previous to the inverſion of the matraſs, and the mouth of the latter immerſed in the water; on which that fluid ſoon began to riſe, and continned to do ſo till ſeven eighths of the veſſel were full. In caſe of ſlow combuſtion, where common air is diminiſhed and phlogiſticated, the dephlogiſticated kind was found to be almoſt entirely deſtroyed.

The purity of dephlogiſticated air is aſcertained by its degree of diminution with nitrous air; which is to be conſidered as a phlogiſtic proceſs. Very great differences are perceived in this reſpect; and according to the quantity of diminution, the air is ſaid to be 2, 3, or 4 times better than common air. It is not yet accurately determined how far this proportionable purity extends. Dr. Prieſtly mentions ſome extracted from red lead 5 times as pure as common air. Another quantity, produced from a ſolution of mercury in nitrous acid, was ſo pure, that one meaſure of it mixed with two of nitrous air, which had been obtained in the firſt part of the ſame proceſs, occupied only 0.03 of a meaſure. On the whole, he is inclined to think, that, were it poſſible to make both the dephlogiſticated and nitrous air in the greateſt purity, and then to mix them in ſome exact proportion, the aerial form of them both would be deſtroyed, the whole quantity ſeeming to diſappear, in a mixture of alkaline and acid air.

The pureſt dephlogiſticated air, however, is capable of being contaminated by ſome of the proceſſes which affect the atmoſphere. Dr. Prieſtly found one tenth conſumed by a quantity of clean dry nails, which had remained in it nine months, though without being ruſted. The effects of combuſtion have already been related, viz. as producing a great quantity of pure fixed air; but putrefaction and animal reſpiration probably contaminate it as in atmoſpheric air. Mr. Cavallo informs us, that when an animal is confined in dephlogiſticated air till it dies, that air is not ſo bad but that it will ſtill be capable of diminution by nitrous air; which ſeems to ſhow, that dephlogiſticated air is ſomewhat different from pure common air; or that common air is originally different from dephlogiſticated air lowered by the addition of phlogiſton. It is certainly very remarkable; and ſometimes a quantity of dephlogiſticated air, after having been breathed by an animal till it died, will appear by the nitrous teſt to be even better than common air. When the experiment is performed over lime water, (to abſorb the fixed air produced in reſpiration,) the diminution by a mixture of nitrous air is leſs than it would otherwiſe be; but it is ſtill diminiſhed much more than common air after an animal has died in it; which ſeems to intimate, that the death of the animal in dephlogiſticated air is principally owing to the fixed air formed by the act of reſpiration.

That dephlogiſticated air is greatly inferior to that of the common atmoſphere in ſupporting vegetable life, has been proved by the experiments of Dr. Prieſtley, Mr. Fontana, Mr. Scheele, Dr. Ingenhouſz, &c. Dr. Prieſtley introduced 3 ſprigs of mint, into different jars of dephlogiſticated air, common air, and air which had been phlogiſticated with nitrous air, ſeveral months before. The plant in the phlogiſticated air grew much better than that in common air; while that in the dephlogiſticated air had a very ſickly appearance. It was found, however, that though the plant in phlogiſticated air had grown ſo well, the air was not ſenſibly improved by it, while the dephlogiſticated air was injured by the plant.

3. *Of the Composition of Dephlogisticated Air.*

When Dr. Prieſtley firſt diſcovered the exiſtence of this fluid, he imagined it was compoſed of the nitrous acid and earth, with as much phlogiſton as was neceſſary to its elaſticity; and that the common atmoſphere had as much more as was neceſſary to bring it into the mean condition in which we find it. His experiment however were oppoſed by others made by M. Lavoiſier; who inſiſted, that when a ſolution of mercury was carefully diſtilled, the metal was obtained in full quantity, or with ſcarce any loſs, notwithſtanding the dephlogiſticated air produced. Having put 3 ounces and one dram of mercury into red precipitate, and afterwards revived it, a very few grains of the metal were loſt. Mr. Fontana repeated the experiment often, loſing leſs than a grain. The veſſel he had uſed had a neck of about 2 feet long; and he particularly remarks, that, in order to ſucceed in this experiment, the fire ſhould be managed with very great dexterity; for, if that be too ſtrong part of the precipitate will be volatilized. Theſe experiments were oppoſed by others made by Dr. Prieſtley: but ſtill the quantity of the mercury loſt, or rather the proportion of it to that of the metal employed, was always various, and the difference not very ſmall; whence M. Cavallo and others, with great appearance of reaſon, conclude, that the true reaſon of any perceptible loſs was the ſtrong heat made uſe of in the diſtillation; and conſequently that there is no reaſon to ſuppoſe that any earth exiſts in dephlogiſticated air.

The next enquiry was, whether any of the nitrous acid exiſted in dephlogiſticated air? That it contains none in a proper ſtate of acidity, is indeed evident from many deciſive experiments; but an idea was naturally entertained, that in the formation of dephlogiſticated air, the nitrous acid was decompoſed, and part of it entered into the compoſition of the aerial fluid. This gave riſe to the theories of M. Lavoiſier and Mr. Kirwan, which are noticed under the articles ACIDS and ACID NITROUS; as well as to the experiments of Mr. Watt, which tended to ſhow that no nitrous acid was deſtroyed in the compoſition of dephlogiſticated air.

Very ſingular phenomena have been obſerved, upon calcining metals in dephlogiſticated air, and which ſeem to throw great light upon the compoſition of this fluid. "One of the moſt ſimple of all phlogiſtic proceſſes (ſays Dr. Prieſtley) is that in which metals are melted in dephlogiſticated air. I therefore began with this, with a view to aſcertain whether any water be produced when the air is made to diſappear in it. Accordingly, into a glaſs veſſel, containing 7 ounce meaſures of pretty pure dephlogiſticated air, I introduced a quantity of thin iron turnings. I then fired the iron by means of a burning lens, and preſently reduced the 7 ounce meaſures to 0.65 of a meaſure; but I found no more water after this proceſs than I imagined it had not been poſſible for me to exclude, as it bore no proportion to the air which had diſappeared. Examining the reſiduum of the air, I found one-fifth of it to be fixed air; and when I tried the purity of that which remained by the teſt of nitrous air, it did not appear that any phlogiſticated air had been produced in the proceſs; for though it was more impure than I ſuppoſe the air with which I began the experiment muſt have been, it was not more ſo than the phlogiſticated air of the 7 ounce meaſures, which had not been affected by the proceſs, and which muſt have been contained in the reſiduum, would neceſſarily make it. In this caſe, one meaſure of this reſiduum, and 2 of nitrous air, occupied the ſpace of 0.32 of a meaſure. In another, 10 ounce meaſures of dephlogiſticated air were reduced to 0.8 of a meaſure; and by waſhing in lime-water to 0.38 of a meaſure. In another experiment, 7 and a half ounce meaſures of dephlogiſticated air were reduced to half an ounce meaſure, of which one-fifth was fixed air, and the reſiduum was quite as pure as the air with which I began the experiment; the teſt with nitrous air, in the proportions above-mentioned, giving 0.4 in both caſes."

From theſe experiments the Dr. was led to the diſcovery, that the dephlogiſticated air had actually been imbibed by the melted iron, in the ſame manner as inflammable air had been imbibed by the melted calces of metals in his former experiments. In the firſt inſtance, about 12 ounce meaſures of dephlogiſticated air had diſappeared, and the iron had gained 6 grains in weight. On repeating the experiment other qualities of iron, treated in the ſame manner, gained an addition of weight, always nearly that of the air which had diſappeared.

Dr. Prieſtley now proceeded to try the effect of fuſing iron in the open air by means of a burning lens, and he preſently found that it ſaturated itſelf with pure air from the atmoſphere. "I always found, ſays he, that it had gained weight in the proportion of 7½ to 24. The ſame was the effect when I melted ſteel. But I have reaſon to think, that with a greater degree of heat than I could apply, the iron might have imbibed more than even one-third of its original weight." On attempting to revive the calx of iron in inflammable air, a very unexpected appearance took place. Having put a piece of iron ſaturated with pure air into a veſſel filled with inflammable air, confined with water, the inflammable air diſappeared, and the metal was revived; but on weighing it, 2 and a half grains of 11 and a half had been loſt, beſides the 7 and a half ounce meaſures of inflammable air which had vaniſhed. Conſidering all theſe circumſtances, the Doctor had now no doubt that the two kinds of air had united, and formed either fixed air or water; and with a view to determine this point, he repeated the experiment in a veſſel where the inflammable air was confined by mercury, both the veſſel and mercury having been previouſly made as dry as poſſible. He had no ſooner begun to heat the iron, than the air was perceived to diminiſh, and at the ſame time the inſide of the veſſel to become cloudy, with particles of dew that covered almoſt the whole of it. Theſe particles by degrees gathered into drops, and ran down. On collecting this water by means of a piece of filtering paper, he found it as nearly as poſſible of the ſame weight with that which had been loſt by the iron; and alſo that the quantity of inflammable air which had diſappeared was about double that of the dephlogiſticated air ſet looſe in the operation. Thus, at one time, a piece of this flag abſorbed 5 and a half ounce meaſures of inflammable air, while it loſt the weight of about 3 ounce meaſures of dephlogiſticated air, and the water collected weighed 2 grains. Another time, a piece of flag loſt 1.3 grains, and the water produced was 1.2 grains. In a third caſe, where 6 and a half once meaſures of inflammable air were reduced to 0.92 of a meaſure, the iron had loſt the weight of 3.3 ounce meaſures of dephlogiſticated air, or nearly 2 grains. The Doctor next tried the calx of copper, and found water produced in the inflammable air in the ſame manner. On uſing precipitate *per ſe*, he found no more water than might be ſuppoſed to have been contained as an extraneous ſubſtance either in the inflammable air, or in the red precipitate.

With iron, however, the caſe was vaſtly different. As he had formerly ſatisfied himſelf that inflammable air always contains a portion of water, and alſo that when it has been ſometime confined by water, it imbibes more, he repeated the experiment with inflammable air received in a veſſel of dry mercury; but in this caſe the water was produced, to appearance, as copiouſly as before. "Indeed, (ſays he) the quantity of water produced, ſo greatly exceeding the weight of all the inflammable air, is ſufficient to prove that it muſt have had ſome other ſource than any conſtituent part of that air, or the whole of it, together with water contained in it, without taking into conſideration the correſponding loſs of weight in the iron. I muſt here obſerve, that the iron flag which I had treated in this manner, and which had thereby loſt the weight which it had acquired in dephlogiſticated air, became perfect iron as at firſt, and was then capable of being melted by the burning-lens, agian, ſo that the ſame piece of iron would ſerve for theſe experiments as long as the operator ſhould chooſe. It was evident, therefore, that if the iron had loſt its phlogiſton in the preceding fuſion, it had acquired it again from the inflammable air which it had abſorbed; and I do not ſee how the experiment can be accounted for in any other way." Theſe experiments certainly throw ſome light on the compoſition of dephlogiſticated air; and others made by Mr. Cavendiſh, Dr. Prieſtley, and the French chemiſts, upon water, have a ſimilar tendency. From all of them, it is concluded by the moſt celebrated philoſophers and chemiſts, that dephlogiſticated air is one of the conſtituent and elementary parts of water, iflammable air being the other.

From the experiments made to aſcertain this important fact, an account of which may be found in the Philoſophical Tranſactions, (lxxiv. 125.) Mr. Cavendiſh draws the following concluſions. He ſays—"There ſeem two ways by which the production of the nitrous acid may be explained: firſt, by ſuppoſing that dephlogiſticated air contains a little nitrous acid, which enters into it as one of its component parts, and that this acid, when the inflammable air is in ſufficient proportion, unites the phlogiſton, and is turned into phlogiſticated air, but does not when the inflammable air is in too ſmall proportion; and, ſecondly, by ſuppoſing that there is no nitrous acid mixed with, or entering into the compoſition of dephlogiſticated air; but that, when the air is in ſufficient proportion, part of the dephlogiſticated air with which it is debaſed, is by the ſtrong affinity of phlogiſton to dephlogiſticated air, deprived of its phlogiſton, and turned into nitrous acid; whereas, when the dephlogiſticated air is not more than ſufficient to conſume the inflammable air, none then remains to deprive the phlogiſticated air of its phlogiſton, and turn it into acid. If the latter explanation be true, I think we muſt allow that dephlogiſticated air is in reality nothing but *dephlogiſticated water*, or water deprived of its phlogiſton; or, in other words, that water conſiſts of dephlogiſticated air united to phlogiſton. On the other hand, if the former explanation be true, we muſt ſuppoſe that dephlogiſticated air conſiſts of water united to a little nitrous acid, and deprived of its phlogiſton: but all of the nitrous acid in it muſt only make a very ſmall part of the whole, as it is found that the phlogiſticated air, into which it is converted, is very ſmall in compariſon of the dephlogiſticated air. I think the ſecond of theſe explanations ſeems much the moſt likely; as it was found that the acid in the condenſed liquor was of the nitrous kind, not only when the dephlogiſticated air was prepared from nitrous acid, but when procured from plants or turbith mi-

eral,

This ſimple experiment is ſufficient to convince us, that the oxygenated muriatic acid is really nothing but a combination of the muriatic acid with the baſe of vital air, or oxygene, which is in ſuch quantity in the black calx of manganeſe, that we need only urge this calx by a violent heat to draw off a great quantity ; and when it is no longer proper for forming the oxygenated muriatic acid, inaſmuch as it is deprived of that portion of oxygene which ſhould combine with a part of the muriatic acid.—It is obſervable, that light has the property of diſcharging the oxygene which has combined with the muriatic acid, by reſtoring to it that elaſticity of which it was partly deprived ; which heat alone is not able to do. It appears that light combines with the oxygene, and that it is to this combination the elaſtic ſtate of vital air is owing, which, in loſing afreſh its elaſticity by combuſtion (that is to ſay, by a rapid union with certain ſubſtances,) lets alſo the principle of light eſcape, and at the ſame time much heat is diſengaged ; the true relation of which to light we are as yet ignorant of.—If vegetable colours are plunged into the oxygenated muriatic acid, they diſappeared more or leſs ſpeedily, and more or leſs completely ; when there is a mixture of different colouring particles, ſome of them diſappear more eaſily, and admit only thoſe to be perceived which offer a great reſiſtance, but which have nevertheleſs ſuffered a greater or leſs alteration. It is moſt commonly the yellow parts which reſiſt the moſt, but all at laſt diſappear ; and, when the oxygenated muriatic acid has ſpent its power, it is brought back to the ſtate of common muriatic acid ; the colouring particles have therefore taken away its oxygene, and have acquired by that combination new properties, having loſt that of producing colours. We ſhall not ſay any more at preſent about the properties of theſe exygenated particles ; the oxygenated muriatic acid evidently owes the property of deſtroying colours to oxygene, with which it is combined in graat quantity, but with which it is very looſely connected, and therefore eaſily enters into combination with thoſe ſubſtances which have any affinity with it. The affinities of theſe colouring particles (ſo various in nature) with oxygene, with light, with alkalies, and other chemical agents, cannot but form a very intereſting, and almoſt entirely new, part of philoſophy.

Acid, phosphoric, a name given to two animal acids, viz. the acid of Bones, and the Microſmic, or the acid of Urine. But notwithſtanding this, it may alſo be ranked among the vegetable acids, as it is produced by diſtilling muſtard and other vegetables over a violent fire. This acid is one of thoſe that have the property of reſiſting the power of fire, and of vitrifying, or melting into a kind of glaſs. They have alſo an advantage over the ſtrong acids, that are volatile, for in a very ſtrong heat they will expel even the vitriolic acid. Meſſrs. Lavoiſier and Kirwan agree in their analyſis of this acid, differing only with regard to its acidifying principle, as above mentioned. See Acids. From M. Lavoiſier's analyſis, as adopted by Mr. Kirwen, it appears, that it conſiſts of a pecular baſis, united to 2.265 of its weight of the acidifying principle, and that 100 grains of dry phoſphoric acid contains about 69 of that principle, and 31 of its peculiar baſis : 100 grains of the phoſphoric baſis take up 226.5 of fixed air, or 32.9 of phlogiſton, when it becomes phoſphorus ; and 100 grains of phoſphorus contain 75.24 of baſis, and 24.76 of phlogiſton. The baſis of this acid is the only one that can be procured free, both from the acidifying principle and the phlogiſton. It is called, though rather improperly, not being ſoluble in water, the *glacial phoſphoric acid.* M. Lavoiſier is of opinion that phoſphorus is a ſimple ſubſtance containing no phlogiſton, and that the phoſphoric acid conſiſts of the acidifying principle united with it.

Acid, Saccharine, or the **Acid of Sugar**, has alſo of late occaſioned ſome controverſy among the literati. Mr. Kirwan ſays, that ſugar itſelf is a compound of fixed air, with a much larger proportion of inflammable air, and ſome water, all condenſed to a degree of which we are ignorant, but retaining, upon the whole, much more ſpecific heat than either oil or charcoal ; though he ſeems inclined to the hypotheſis of Mr. Morveau, that this ſubſtance has for its baſis a fine ethereal oil, to which a large proportion of condenſed inflammable air is ſuperadded. The acid of ſugar, then, ſays he, conſiſts of this peculiar baſis deprived of its ſuperfluous phlogiſton, and united to a great quantity of fixed air in a concrete ſtate. He adds, that it does not exiſt ready formed in the ſugar, but is produced in the operations that ſubſtance undergoes : that it derives moſt of its acid principle from the nitrous acid employed ; the nitrous baſis taking up the phlogiſtion, and the fixed air of the nitrous acid combining with the ſaccharine baſis. He conteſts an opinion of M. Lavoiſier, that ſugar is a ſort of *charcoal*, which, uniting with the oxygenous principle of the nitrous acid, decompoſes it, ſets looſe the nitrous air, and forms the ſaccarine acid ; and that, towards the end of the operation, the ſaccharine acid itſelf is decompoſed : the conſequence of which is the production of fixed air, which, ſays he, is only the oxygenous principle combined with charcoal. On this Mr. Kirwan remarks, 1. "That, according to this theory, the acid of ſugar ſhould be the ſame with fixed air, ſince both are compoſed of the oxygenous principle united with charcoal ; or, if M. Lavoſier ſhould reply, that ſugar is different from common charcoal, he inſiſts that, according to his own table of affinities, the oxygenous principle has a much ſtronger attraction for charcoal than for ſugar, and conſequently that the latter ought to be decompoſed by the former ; nay, that it ſhould be regenerated by various metallic ſubſtances, which have a greater attraction for their principle. 2. The ſaccharine acid ought to weigh more than the ſugar employed in the operation ; which is ſo far from being the caſe, that it is univerſally agreed to be much leſs ; Bergman making it only one third, Mr. Chaptal from one third to two fifths, and Mr. Sage 10 ſixteenths. 3. If the ſaccharine acid conſiſted of ſugar, or conſiſted of that ſubſtance undecompoſed, and barely united to the oxygenous principle, it ought to be formed by treating ſugar with the black calx of manganeſe, or with dephlogiſticated marine acid ; both of which have leſs attraction for the oxygenous principle than ſugar. If the acid of ſugar be diſtilled, it is wholly converted into water, fixed inflammable air, and not a particle of coal or dephlogiſticated air is found in it. It is not therefore reaſonable to look on either of them as its conſtituent principles ; but as fixed air alone can be extracted from all vegetable acids, it ſeems to be the true acidifiable principle.

Acid of Sea Salt. See Acid, Marine.

Acid, Septic, or Acid of Septon, is an acid formed during the putrefaction of ſuch bodies as contain ſepton or azote in degrees of heat from 85 degrees of Farenheit's thermometer, to 110 degrees or upwards. Lean meat, which abounds with ſepton, very commonly turns to ſeptic acid as it corrupts; and in the ſea ports of America, *beef* has been a frequent example of it. Tainted or ſpoiled barrels of this kind of meat, exhale great quantities of this acid in a gaſeous ſtate. Putrefying hides of neat cattle imported from South America, often times turn to ſeptic acid in the Atlantic cities of North America, to which they are imported. Corrupting cod-fiſh and herrings, and indeed fiſhes of all kinds, are capable of affording the ſame ſpecies of acidity. The like product is engendered during the corruption of animal carcaſes of all kinds, in convenient degrees of heat, ſuch as thoſe of *human beings* in grave yards, of *horses*, *cows*, and even of ſwarms of *insects* and *aquatic worms*, which ſometimes have tainted the air of the neighbourhood where they rotted. Human and other excrements, as ſweat, urine, and fæces, are capable of furniſhing great quantities of ſeptic acid. In ſhort, this is, perhaps, the moſt frequent and active acid in nature.

Its hiſtory had been overlooked until the year 1795, when it attracted the attention of Dr. Mitchill, profeſſor of Chemiſtry, in the college of New-York. It appeared to this gentleman, that ſeptic acid was the very matter of peſtilential air or infection, and when volatized by the heat of American ſummers, contaminated the atmoſphere of the cities, and became the exciting cauſe of that *plague*, or *yellow fever*, which forms the endemic of thoſe places. If ſeptic acid was formed in the alimentary canal, from the beef or other food corrupting there, *dysentery* might be the conſequence. If generated in the mouth, from the remains of food ſticking there, *erosion of the teeth*, and inflamed gums, would be the reſult. When produced on the ſkin, and in the clothing and bedding of poor and unclean people, *typhus fever* is cauſed by it.—Theſe are ſome of the new and extraordinary concluſions to which Dr. M. has arrived in the proſecution of this department of phyſics.

The grand and practical inference from all which diſcoveries is, that the exciting cauſe of theſe formidable diſtempers being an acid, is capable of being neutralized and overcome by alkalies. Theſe ſubſtances, therefore, in the forms of pot-aſh, ſoda, ley, ſoap, and lime, are recommended by him as the antidotes to every mortification of this ſeptic poiſon, and ranked among the moſt powerful of all anti-ſeptics. Hence this inveſtigator has given a theory of Cleanlineſs and Waſhing, as applicable to human bodies, their clothing and bedding; a theory of the operation of Alkaline and Neutral Salts, as articles of the Materia Medica; a theory of the manner in which Sea-Salt or Muriate of Soda prevents putrefaction; a theory of the proceſs of Putrefaction itſelf; a theory of the decay of Teeth and Bones; a theory of the effects of Septic Acids as a Manure or a Poiſon according to its operation upon vegetables. Each of theſe conſtitues a diſtinct portion of inductive reaſoning, and open broad views of the working of this remarkable production. Theſe may be ſeen at large, in the Medical Repoſitory, or American Philoſophical Journal, begun in New-York, in 1797, and publiſhed in quarterly numbers regularly ſince that time. In this may be ſeen too, Dr. M's new Conſiderations on the Function of the Liver, and the true uſe of the Bile; and his propoſal for counteracting Septic Acid in cities, by building all the houſes of *lime-stone* or ſome other form of *calcareaus* earth, and paving the ſtreets with the *same materials*.

Acid of Sugar. See Acid, Saccharine.

Acid of Sulphur, fixed and Volatile. The latter of theſe ſaturates ten times as much alkali as the former, but is neither remarkable for any acidity of taſte, nor changes the blue colour of vegetables to red. See Acids, Vitriolic and Volatile.

Acid, Swedish. See Acid Flour.

Acid of Tartar. See Chemistry, Tartar, &c.

Acid of Tungsten, or lapis ponderosus, one of the new acids lately diſcovered by Mr. Scheele, which, however, wants ſome of the ordinary properties of acids, as it has hardly any diſtinguiſhable acidity in the taſte, and does not produce æther when united with ſpirit of wine, nor change the blue colour of vegetables into red. See Chemistry and Tungsten.

Acid of Urine. See Acid Phosphoric.

Acid, Vague, a general term uſed by ſome chemiſts for the vitriolic acid. This mixing with foſſil oil, *petroleum*, *oleum terræ*, or the like, conſtitues the various ſorts of native foſſil tranſparent ſulphurs; uniting with ſemimetals, it forms cinnabar, antimony, and other foſſils both ſolid and fluid; uniting with metals, it forms various kinds of vitriols; with calcarous earths, different alums; and, laſtly, with pyrites, which is the matrix of vitriol, calcined in a wood fire, it produces common ſulphur.

Acids, Vegetable, are thoſe which are procured from vegetable ſubſtances. Such are the juices of ſour fruit, ſour wine, or vinegar; cryſtals of tartar; all the eſſential acid, concrete ſalts, procured by cryſtallization from the expreſſed juices of plants; and laſtly, all the acids obtained from vegetable ſubſtances in analyſing them by diſtillation. They differ from mineral acids in being leſs ſimple, leſs fixed, leſs ſuſceptible of concentration, and weaker.

Acid, Vitriolic, is the ſtrongeſt ſpecies of the mineral acids; and was formerly obtained from martial vitriol. This acid is copiouſly diffuſed through the earth, the waters of the ocean, and the atmoſphere, and is ſuppoſed by ſome to be the baſis of all the other acids. It abounds moſt in the mineral kingdom, combined with various other bodies. Its ſepcific gravity, when it is highly concentrated, is more than double that of water. M. Hellot obtained ſome, concentrated to ſuch a degree as to become ſolid and cryſtalline. This acid being likewiſe more fixed than water, admits a much greater degree of heat. It very freely imbibes moiſture, and acquires hereby a very conſiderable increaſe of weight. It diſſolves the aſhes of vegetable and calcareous earths; and when combined with the latter forms a matter called *selenites*, reſembling ſalt in its appearance, but differing from it in taſte and ſolubility. It may be likewiſe combined with alkalies both vegetable, fixed, and foſſile. This acid alſo acts upon all metallic ſubſtances by means of their phlogiſton, and diſſolves them with a moderate efferveſcence and heat; and by diſcharging part of the inflammable principle, calcines them more or leſs, according to their nature, and the manner of making ſolution. When ſtrongly concentrated, it will act powerfully on oils;

and being diſtilled together with ſpirit of wine, yields æther. This vitriolic acid is more ſimple and powerful than the nitrous and marine acids, ſeparates them from the alkalies to which they are united, and ſubſtitutes itſelf in their place. It may be procured by collecting the vapour of burning ſulphur, confined by means of a glaſs bell, and received into the vapour of water. The opinion of the antiphlogiſtians is, that the vitriolic acid, when conſidered abſtractedly from the water it contains, always conſiſts of ſulphur (which they conſider as a ſimple ſubſtance) united to a large portion of the oxygenous principle. But in the opinion of Mr. Kirwan "it conſiſts of a baſis or radical principle, which, when ſaturated with phlogiſton, conſtitutes ſulphur; when ſaturated with fixed air, becomes common fixed vitriolic acid; and, when combined partly with the one and partly with the other, becomes volatile vitriolic acid. That ſulphur, during its converſion into vitriolic acid, unites to air of ſome ſort or other, is evident from the quantity of air which it abſorbs, in whatever way that converſion is brought about. Thus, firſt, during combuſtion in reſpirable air, 100 grains of ſulphur abſorbed 420 cubic inches of pure air, or about 143 grains: but the proportion of this pure air, united with a given quantity of ſulphur is not eaſily determined, becauſe it is vitriolic air that is conſtantly formed; and this air eſſentially contains ſome portion of ſulphur in ſolution, which portion is variable. Secondly, Pyrites, during their decompoſition, abſorb a conſiderable proportion of pure air; as M. Lavoiſier has obſerved; ſo alſo does liver of ſulphur expoſed to the atmoſphere, for after ſome time it is converted into tartar vitriolitate."

Acids, Volatile, are thoſe which are more volatile than other acids: ſuch is the volatile vitriolic, or ſulphureous acid, which is only the common vitriolic acid combined with phlogiſton. Thoſe who are deſirous of further information concerning the ſubject of acids in general, and the ſeveral claſſes and ſpecies of them above enumerated, may conſult Neumann's Works, tranſlated by Dr. Lewis, Macquer's Dictionary of Chemiſtry, Fourcri's Chemiſtry, &c.

Acids, in the Materia Medica, denote ſuch medicines as are poſſeſſed of an acid quality: as vinegar, ſpirit of vitriol, &c. Mr. Boyle obſerves, that acids not only diſturb the body while they continue acid, but in many caſes create diſtempers, whereof they ſhould ſeem the remedies. Helmont aſſerts that no acid can be lodged naturally in any part of the body, except the ſtomach; and if it extend farther, it becomes unnatural, infects the ſweet and balſamic juices, and proves the cauſe of moſt diſeaſes. To correct the redundancy of acids in the ſtomach, all alkalious, or urinary ſalts, both fixed, as of wormwood, centuary, carduus; and volatile, as ſpirit of ſal ammoniac, ſpirit of ſalt of hartſhorn, ſcurvy graſs, &c. are recommended. Under correctives alſo come all fixed, earthy, or metalline concretes, which abſorb the acid, as iron, ſaccharum ſaturni, antimony, and all oils and fat things, which obtund and inoſculate the parts of acids, as ſpirit of wine, oil of cloves, &c. The medicinal qualities of acids are much diſputed by many phyſicians. Some alledge that they are hurtful in coughs, and moſt of them, the juice of lemons excepted, in diſeaſes of the breaſt. A large doſe of ſuch as are very concentrated, taken internally, would prove a very corroſive poiſon. However, acids, properly adminiſtered, are excellent cooling and apertive medicines, fit to quench thirſt, to leſſen the acrimony of the bile; theſe, being powerful antiſeptics, are eſteemed good in all putrid and malignant diſeaſes; nor are they leſs efficacious in inflammatory and feveriſh caſes. But great care ought to be taken not to adminiſter them in ſuch large quantities, as to corrode the bowels, or to coagulate the blood. Acids are alſo commended in the plague, and as ſtyptics. Thus vinegar not only ſerves to ſtop hæmorrhage, but being ſprinkled upon a red-hot tile, or iron, corrects the putrefaction of the air.

ACIDULÆ, medicinal ſprings impregnated with ſharp particles, as all the nitrous, chalybeate and alum ſprings are.

Acidulæ, in natural hiſtory, a ſpecies of mineral waters, diſtinguiſhed by a latent acidity in their nature. When they are accompanied with heat they are called *acidulæ*; but if heat be added to their briſk ſpirit, they are denominated *thermæ*. *Acidulæ* are native waters, impregnated with particles of ſome acid mineral, as vitriol, alum, nitre, or ſalt; and as Dr. Seip of Pyrmont firſt diſcovered, 1736, and Dr. Brownrigg of Whitehaven farther evinced, with a conſiderable quantity of fixed air, formerly known by the name of the ſpirit of mephitis, to which they owe their briſk ſparkling quality. For Dr. Prieſtley's method of making artificial waters of this kind, ſee the article Pyrmont. The phyſicians alſo frequently include chalybeate and aluminous or ferruginous waters, under the claſs of *acidulæ*. Their virtues depend, in general, on the principles and ingredients in their compoſition. A general analyſis of mineral waters may be made, either by evaporation, which may diſcover both the quantity of ſolid matter contained in the water, and by ſubſequent trials, the peculiar nature of it: or by diſtillation, whence it may be known, whether the water contains any volatile matter, ſaline or bituminous; or again, by the mixture of certain liquors. The moſt common for this purpoſe are the infuſion of galls, ſyrups of violets, oil of tartar, volatile, alkaline ſalts, tincture of ſulphur, and aquafortis. A ſmall quantity of the infuſion of galls will diſcover wheter the water be impregnated with iron. If it contains a coarſe oker, the colour ſtruck by the galls is very dark; the finer iron produces an inky purple; but the fineſt, ſuch as the prymont water contains, gives an azure blue. A dram of ſyrup of violets, mixed with a ſmall wine glaſs of the mineral water, will produce a green colour, if there be any alkaline ſalt, or alum, in it; though Dr. Rutty ſays, that if the ſpirit be new, alum will turn it red. This green colour is alſo obſerved, when a ſolution of iron is met with; with an acid, the ſyrup produces a red. Volatile alkaline ſalt precipitates the contents of hard water, and diſcovers mercury, or any of its preparations, by turning the liquor whitiſh, and coagulating part of it. It diſcovers copper, by producing a blue colour. Volatile tincture of ſulphur diſcovers lead in water, by turning it into a duſky brown colour. Aquafortis turns the water into a green colour; if it contains a ſolution of copper.

To **ACIDULATE**, to impregnate or tinge with acids in a ſlight degree.

ACIDULATED, medicines that have an acid in their compoſition.

ACIDULOUS denotes a thing that is ſlightly *acid*; it is ſynonymous with the word *ſub-acid*.

ACIDUM Aereum, fixed air.

Acidum æthereum, *aluminoſum*, *catholicum*, *primigenium*, *ſulphureum*, names for ſpirit of vitriol.

Acidum pingue, an imaginary acid, which ſome German chemiſts ſuppoſed to be contained in fire, and by combining with alkalis, lime, &c. to give them their cauſtic properties; an effect which is found certainly to depend on the loſs of their fixed air.

Acidum vitrioli vinosum. See Aether.

ACINACES, in antiquity, a kind of cutlaſs or ſcimetar, in uſe among the Perſians.

ACINARIA, in botany, a name given by ſome to the marſh whortle-berries, or vaccinia paluſtria.

ACINESIA, the immobility of the whole body or any part of it, as in a palſy, apoplexy, &c.

ACINI, in botany, ſmall grains, or berries growing in bunches, after the manner of grapes; alſo the ſtones or ſeeds of grapes. The berries of the elder, privet, ivy, &c. are of this kind, and ſo called.

Acini glandulosi, in anatomy, ſome glands ſo called from their formation.

ACINIFORMIS tunica, the ſame with the tunica uvea of the eye. It is alſo called *acinoſa tunica*.

ACINIPPO, in ancient geography, a town of Bœotia; its ruins, called *Ronda la Viega*, are to be ſeen near Arunda, in the kingdom of Granada.

ACIONDENDRON, in botany, the name given by Burman, to a ſpecies of plants, called Molaſtoma, belonging in the Linnæan ſyſtem, to the genus thymus, and to the claſs and order didynamia gymnoſpermia.

ACINOS, ſtone, or wild Baſil.

ACINUS properly ſignifies the grape. See Acini. It is alſo the name of the ſtaphyloma.

ACIPENSER. Accipenser.

ACITLI, in ornithology, the common Mexican name for the great creſted diver, common to Europe and America, and more uſually called by authors, the lepus aqueus, or water hare.

ACKEN, a ſmall town in the duchy of Magdeberg, ſituated on the Elbe, 5 miles below Deſſaw. It has a citadel. Lat. 51. 52. N. Long. 87. 52. E.

To ACKNOWLEDGE. 1. To own the knowledge of; to own any thing or perſon in a particular character. 2. To confeſs; as, a fault. 3. To own; as, a benefit.

ACKNOWLEDGING, grateful; ready to acknowledge benefits received.

ACKNOWLEDGMENT. 1. Conceſſion of any character in another; as, exiſtence, ſuperiority. 2. Conceſſion of the truth of any poſition. 3. Confeſſion of a fault, or of a benefit received.

Acknowledgment money, a certain ſum paid by tenants, in ſeveral parts of England, on the death of their landlords, as an acknowledgement of their new lords.

ACLIDES, in Roman antiquity, a kind of miſſive weapon, having a thong fixed to it, by which, after caſting it out of the hand, it might be drawn back again. Servius deſcribes the aclides as full of ſpiculæ, or eminences. It was full of ſpikes, and ſo would do miſchief both where it ſtruck, and in the withdrawing. Each warrior ſeems to have been furniſhed with two.

ACLOWA, in botany, a barbarous name of a ſpecies of Colutea. It is uſed by the natives of Guinea to cure the itch: They rub it on the body as we do unguents.

ACMASTICA, a continued fever.

ACME, the height of any thing; more eſpecially uſed to denote the height of a diſtemper, which is divided into four periods. 1. The *archе*, the beginning or firſt attack. [illegible] *Anabaſis*, the growth. 3. *Acme*, the height. And 4. *Paracme*, which is the declenſion of the diſtemper.

ACMONIA, or Agmonia, in ancient geography, 1. a town of Phrygia Major, now in ruins, called by Cicero, *civitas Acmonenſis*. 2. A city of Dacia, on the Danube, near the ruins of Trajan's bridge, rebuilt by Severus and called *Severicum*. It is ſituated 12 German miles S. E. from Temeſwar.

ACNE, a name given to a ſmall pimple, or hard tubercle, on the face.

ACNIDA, Virginian Hemp, in botany, a genus of the diœcia order, belonging to the pentandria claſs of plants; and, in the Natural Order, aſſociating with the Scabridæ. The characters are: In the male, the calyx is a perianthium conſiſting of five leaves, ovate, concave, acute, and membranous on the margin. No corolla. The ſtamina conſiſt of five very ſhort capillary filaments; the antheræ are verſatile, two-celled, and forked at both ends.—Female on a ſeparate plant; of which the calyx conſiſts of an involucrum many-leav'd, linear, and deciduous; and a perianthium two-leaved, very ſmall, and perſiſtent. No corolla. The piſtillum has an ovate germen; the ſtyli are five, long, reflected, and downy; the ſtigmata are ſimple. The pericarpium is an egg ſhaped fruit, compreſſed, many angled, ſulcated, and covered with a ſucculent calyx. The ſeed is ſolitary, round, and compreſſed. There is only one ſpecies of it, viz. the acnida cannabina. It is a native of Virginia, and the neighbouring ſtates; but is rarely cultivated elſewhere, it being at preſent applied to no uſeful purpoſe.

ACNUA, in Roman antiquity, ſignified a certain meaſure of land, near about the Engliſh rood, or fourth part of an acre.

ACO, a name given to a fiſh found in the Mediterranean, called alſo aquo, ſarachus, and ſarachinus.

ACOLCHICHI, in ornithology, the Mexican name for a bird, deſcribed by Nieremberg, under the name of the Petrophœnicus Indiarum.

ACOLIN, in zoology, the name of a bird of the partridge kind, common in the Spaniſh Weſt Indies. It is no larger than a ſtarling; its legs and feet are of a pale greeniſh colour, and its toes very long; beak yellow, and ſomewhat long; its head ſmall; breaſt and belly white; ſides ſpotted with brown, and its back and tail of a duſky yellow brown; the tail is very ſhort, and both that and the back have ſome black ſpots, and narrow ſtreaks of white. It frequents the ſides of lakes, and is ſuppoſed to feed on flies, worms, and other inſects, which are found about watery places. It is a tolerably well-taſted bird.

ACOLOTHIST, or Acolyte, one of the loweſt order in the Romiſh church, whoſe office it is to prepare the elements of the office, to light the church, &c.

Acolythi, in eccleſiaſtical hiſtory is peculiarly applied to thoſe young people, who, in the primitive times, aſpired to the miniſtry; and, for that purpoſe, continually attended the biſhops. In the Romiſh church, the acolythia were of longer continuance; but their functions were different from thoſe of their firſt inſtitution. They were ſuch as had only received the firſt of the four leſſer orders, whoſe buſineſs was to light the tapers, carry the candleſticks, and the incenſe-pot, and prepare the wine and water. At Rome there were three kinds of acolythi; viz. *palatini*, who waited on the pope; *ſtationarii*, who ſerved in churches; and *regionarii*, who, together with the deacons, officiated in other parts of the city.

ACOLYTHIA, in the Greek church, denotes the office, or order of the divine ſervice. The ſame name is alſo given to the prayers, ceremonies, hymns, and the like, whereof the Greek ſervice is compoſed.

ACOMA, a town of North America, in New Mexico, ſeated on a hill, with a good caſtle. To go into the town, one muſt walk up 50 ſteps cut out of the rock. It is the capital of that province, and was taken by the Spaniards in 1599. Lat. 35. 0. N. Long. 29. 15. W.

ACOMAC, a county in Virginia, which is a peninſula, being bounded on the N. by Maryland, on the E. and S. by the ocean, and on the W. by the bay of Cheſapeak. Cape Charles is at the entrance of the bay, and is the moſt ſouthern promontory of that country. It contains about 14,000 inhabitants, including about 4,500 ſlaves.

ACONCROBA, *n. s.* in botany, a plant that grows wild in Guinea, and is much eſteemed for its virtue in the ſmall-pox. It is given infuſed in wine. The leaves are opake, and as ſtiff as thoſe of the phillery; they grow in pairs, and ſtand on ſhort foot-ſtalks; they are ſmall at each end, and broad in the middle: and the largeſt of them are about three inches in length, and an inch and quarter in breadth, in the middle. They ſomewhat reſemble thoſe of our bay. They are of a duſky colour on the upper ſide, and of a pale green underneath.

ACONE, *n. s.* in antiquity, 1. A ſtone uſed as a whetſtone, and for ſeveral other purpoſes; but more uſually known among the Romans by the name Coticula. 2. A mortar for the purpoſe of levigation.

Acone, in ancient geography, a city in Bythinia, famous for producing poiſonous herbs, and from which the Aconite had its name.

ACONITE, *n. s.* properly the herb wolfs-bane, but commonly uſed in poetical language for poiſon in general.

ACONITUM, Aconite, Wolfsbane, or Monkshood; a genus of the trigynia order, belonging to the polyandria claſs of plants. In the natural order, it aſſociates with the Multiſiliquæ. The characters are: There is no calyx: The corolla conſiſts of five unequal petals oppoſite in pairs; the higheſt helmet tubed, inverted, and obtuſe; the two lateral ones, broad, roundiſh, oppoſite, and converging; the two loweſt oblong, and looking downwards: The nectaria are two, piped, nodding, and ſitting on long ſubulated peduncles, and concealed under the higheſt petal: The ſcales are ſix, very ſhort, coloured, and in an orb with the nectaria: The ſtamina conſiſt of numerous ſmall ſubulated filaments; the antheræ are erect and ſmall: The piſtillum has three or five oblong germens, ending in ſtyli the length of the ſtamina; the ſtigmata are ſimple, and reflected: The pericarpium has three or five univalve capſules gaping inward. The ſeeds are numerous, angular, and wrinkled. There are 10 ſpecies, all of which, except No. 7, are natives of the Alps, the mountains of Germany, Auſtria, and Tartary; and require a cool ſhady ſituation, except the wholeſome wolfsbane, which muſt have an open expoſure. They thrive better in a moiſt than dry ſoil: but the ground muſt not be ſo wet as to have the water ſtanding near their roots in winter. They may all be propagated by ſowing their ſeeds in autumn, upon a north border, where they are ſcreened from the ſun. The plants will come up in ſpring, when they muſt be kept clean from weeds during ſummer; and, in very dry ſeaſons, if they are frequently refreſhed with water, their growth will be greatly promoted. The following autumn they ſhould be tranſplanted into ſhady borders, in rows a foot aſunder, and the plants ſix inches diſtant from one another. In this ſituation they may remain two years, when they will carry flowers, and ſo may be tranſplanted to thoſe places where they are to remain.

1. Aconitum alpinum, or large flowered monkſhood, flowers in Auguſt, and will grow to the height of five feet in good ground; the flowers are very large, of a deep blue colour, but not many upon each ſpike.

2. Aconitum altissimum, or greateſt yellow wolfsbane, grows upwards of four feet, and the ſpikes of its flowers are very long.

3. Aconitum anthora, or wholeſome wolfsbane, flowers in the middle of Auguſt, and often continues in beauty till the middle of September; its flowers are not large, but are of a beautiful ſulphur-yellow colour.

4. Aconitum cammarum, grows about four feet high, and flowers in the beginning of July.

5. Aconitum lyctonum, or yellow wolfsbane, grows upwards of three feet high, flowers about the middle of June, and if the ſeaſon is not warm, will continue in flower till Auguſt.

6. Aconitum napellus, bears large blue flowers, which appear in Auguſt, and make a pretty appearance. There are two or three varieties of this kind; one with white, another with roſe-coloured, and a third with variegated flowers; but theſe are only varieties which often change.

7. Aconitum orientale, or eaſtern monkſhood, grows ſometimes more than ſix feet high, and bears a white flower. It is a native of the Levant, from whence the ſeeds of it were firſt ſent by Dr. Tournefort to the late royal garden of Paris, from which ſome other gardens have been furniſhed with ſeeds. It is very rare in Europe at preſent.

8. Aconitum pyramidale, or common blue monkſhood, bears a long ſpike of blue flowers, which appear ſooner than any of the other ſorts, being ſo early as June, or ſometimes even May. The ſpikes of flowers are upwards of two feet long, ſo that it makes a very pretty appearance: the ſeeds are ripe in September.

9. Aconitum Pyreniacum, or Pyrenean monkſhood, flowers in July. It grows about four feet high, and carries a long ſpike of yellow flowers.

10. Aconitum variegatum, or leſſer wolfſbane, ſeldom grows more than two feet high; it carries blue flowers, and the ſpikes of them are remarkably ſhort.

Qualities of the **Aconita.** Since the time of Theophraſtus, moſt of the ſpecies of monkſhood have been reckoned a deadly poiſon both to men and brutes. Dioſcorides, however, recommends the external application of common monkſhood for pains of the eyes. The flowers of a great many ſpecies communicate their noxious qualities by being ſmelled to; and thoſe of the ſpecies No. 6. being placed on the head, occaſion a violent megrim. Of the bad qualities of theſe plants we ſometimes avail ourſelves to get rid of vermin. A decoction of the roots deſtroys bugs. The roots powdered, and adminiſtered in bread or ſome other palatable vehicle to rats and mice, corrode and inflame their inteſtines, and ſoon prove mortal. The juice is uſed to poiſon fleſh with, for the deſtruction of wolves, foxes, and other ravenous beaſts. The beſt antidote to the poiſon of the different monkſhoods is ſaid to be the root of the anthora, a ſpecies of the ſame genus, hence termed *wholeſome monkſhood.* The ſame plant is regarded as efficacious againſt bites of ſerpents and other venomous creatures. The roots have a bitter acrid taſte; the leaves are alſo bitter: the former are chiefly uſed in medicine; and, beſides the excellent quality juſt mentioned, are ſtomachic, and promote perſpiration. The peaſants, who gather the plants on the Alps and Pyrenees, are ſaid to uſe it with ſucceſs againſt the biting of mad dogs, and in curing the colic. It is remarkable, that the monkſhoods with blue flowers are much more virulent than the yellow or white-flowered kinds. Miller aſſerts that the huntſmen of the wolves and other wild beaſts on the Alps, dip their arrows in the juice of thoſe plants, which renders the wounds made by them deadly. That the anthora is an antidote to the poiſon of the reſt of the ſpecies, is not conſidered as a fact ſufficiently eſtabliſhed. Of the effects of the above, indeed, and other vegetable poiſons, medical writers give but a confuſed account. In general, thoſe which are not of the narcotic kind, nor excite violent vomitings and purgings, produce their pernicious effects by irritating the nervous coats of the ſtomachs and inteſtines, ſo as to occaſion violent convulſions, not only in them, but through the whole body. The proper cure is evacuation by vomit; but this is not to be obtained without ſome difficulty; becauſe there is uſually ſuch a contraction about the upper orifice of the ſtomach, that nothing can be either ſwallowed or thrown up. In this caſe, an infuſion of tobacco has been recommended, and may probably be of ſervice: for being itſelf of a very ſtimulating nature, it may for a moment take off the violent ſpaſms occaſioned by the poiſon; in which caſe, a violent vomiting will immediately enſue.—The ſtomach being thoroughly emptied, and deglutition rendered eaſy, the cure may be completed by oily and mucilaginous medicines. On account of the poiſonous qualities of monkſhood, no ſpecies of it ſhould be planted where children have acceſs, leſt they ſhould ſuffer by putting the leaves of flowers in their mouths, or rubbing them about their eyes; for the juice of the leaves will occaſion great diſorder by being only rubbed upon very tender fleſh; and the farina of the flowers, when blown into the eyes, cauſes them to ſwell greatly.

ACONTIUM, *n. s.* in Grecian antiquity, a kind of dart or javelin, reſembling the Roman pilum.

ACOPA, *n. s.* in botany, a name given by Dioſcorides, and ſome authors to the trifolium,paludoſum, or buck-bean.

Acopa, in medicine, denotes remedies againſt the ill conſequences proceeding from laſſitude, occaſioned by too violent labour, exerciſe, or the like; ſuch as tenſions, pains in the bones, &c. They are alſo proper on many other occaſions, ſome being of a warm, others of a mollifying nature. The name is alſo applied to the ſoft cerates made uſe of for tumours, &c.

ACOPICA, marſh trefoil.

ACOPIS, the name of a ſort of foſſil ſalt, deſcribed by Pliny, and ſaid to have been uſed by the ancients, mixed with oil, and heated to rub over the limbs to cure wearineſs. Others ſay it is a precious ſtone like glaſs, marked with ſpots of a golden colour.

ACOPON, *n. s.* or Acopum, in medicine, a fermentation of warm and emollient ingredients, to allay wearineſs.

ACORI, *n. s.* or blue coral, in natural hiſtory. The true acori is very ſcarce; ſome, however, is fiſhed on the coaſts of Africa, particularly from Rio del Re to the river of the Camarones. This coral is part of the merchandize which the Dutch trade for with the Camarones: that of the kingdom of Benin is very much eſteemed. It grows in the form of a tree of rocky bottom. It is alſo a name for the greater Galangal root.

ACORN, *n. s.* the ſeed o fruit borne by the oak.

Acorn, in ſea language, a little ornamental piece of wood, faſhioned like a cone, and fixed on the uppermoſt point of the ſpindle, above the vane, on the maſt head. It is uſed to keep the vane from being blown off from the ſpindle in a whirlwind, or when the ſhip leans much to one ſide under ſail.

ACORUS, Calamus Aromaticus, Sweet Flag, or Sweet Rush: A genus of the monogynia order, belonging to the hexandria claſs of plants; and ranking in the ſecond natural order, Piperitæ. The characters are: The calyx is a cylindric ſimple ſpadix covered with florets: There is no ſpatha, nor perianthium: The corolla is compoſed of ſix obtuſe, concave, looſe petals: The ſtamina conſiſt of ſix thickiſh filaments, ſomewhat longer than the corolla; the antheræ are thickiſh and didymous: The piſtillum has a gibbous oblong germen of the length of the ſtamina; no ſtylus; the ſtigma a prominent point: The pericarpium is a ſhort triangular, obtuſe, three-celled capſula, attenuated at both ends: The ſeeds are numerous, and of an oblong egg ſhape. There is but one ſpecies, the acorus calamus. It grows naturally in ſhallow ſtanding waters, and is found wild in ſome parts of Britain. It grows plentifully in rivulets and marſhy places, and is to be found in the canals of Holland, in Switzerland, and in other countries of Europe. The ſhops have been uſually ſupplied from the Levant with dried roots, which do not appear to be ſuperior to thoſe which grow in England. The leaves are ſometimes two feet long, narrow, compreſſed, ſmooth, and of a bright green, terminating in a point; the root is pretty long, of a whitiſh, reddiſh, and partly greeniſh colour. Among the leaves there ariſes a ſingle one, thicker and more robuſt than the reſt, furrowed on the face, and of a paler green. On this grow frequently two ſpikes of flowers, by many writers called juli. Theſe are of a brown colour, having a chequered ſurface. The root of this plant has a very agreeable flavour, which is greatly improved by drying. It is reckoned carminative and ſtomachic, having a war, pungent, mbitteriſh taſte; and is frequently uſed as an ingredient in bitters. It has been complained of, however, as communicating a nauſeous flavour to thoſe bitters in which it was infuſed; and Neumann obſerves, that its agreeable flavour, as well as its diſtinguiſhing taſte, reſide entirely in a volatile eſſential oil; the reſiduum after diſtillation having a nauſeous flavour, not at all reſembling that of the calamus. It is an ingredient in the mithridate and theriaca of the London pharmacopœia; and in the aromatic and ſtomachic tinctures, and compound arum powder, of the Edinburgh. The freſh root candied is ſaid to be employed at Conſtantinople as a preſervative againſt epidemic diſeaſes. The leaves of this plant have a ſweet fragrant ſmell, more agreeable, though weaker, than that of the roots. Neither horſes, cows, goats, ſheep, nor ſwine, will eat the herb or its roots. The acorus being a perennial plant, may be tranſplanted into a garden, where it will thrive very well if the ground is moiſt; but it never flowers unleſs it grows in water. It loves an open ſituation, and will not thrive well under the ſhade of trees. The flowers appear the latter end of June, and continue till Auguſt.

The Acorus is generally deſcribed as above, both by ancient and modern botaniſts, as well as apothecaries: but ſome make a diſtinction between the Acorus, or common Flag flower, and the Calamus aromaticus, alledging that they are two different ſpecies, and diſtinguiſhed by this' that from the middle of ſome of the leaves of the latter' there ariſes a longiſh cluſter of an infinity of little flowers' the thickneſs of the little finger, and reſembling macropiper, or long pepper: and that the true calamus aromaticus is brought from Lithuania and Tartary; it is knotty, reddiſh without, and white within; as thick as the little finger, and half a foot long. Its principal uſe is in obſtructions of the menſes, ſpleen, and liver; in the cholic, &c.

Acorus adulterinus, or **vulgaris**, in the Materia Medica, the name of the root of the iris lutea paluſtris, or common yellow water flag flower.

Acorus, in the Materia Medica, a name ſometimes given to the great galangal. See Kempferria.

ACOUSTICS, *n. s.* 1. The doctrine or theory of ſounds. 2. Medicines to help the hearing.

Acoustic Duct, in anatomy, the *meatus auditorius*, or external paſſage of the ear. See Anatomy.

Acoustc Medicines, remedies againſt imperfections, and diſorders of the ear.

Acoustic Vessels, in the ancient theatres, were a kind of veſſels, made of braſs, ſhaped in the bell faſhion, which being of all tones within the pitch of the voice or even of inſtruments, rendered the ſounds more audible, ſo that the actors could be heard through all parts of the theatres, which were even 400 feet in diameter.

ACOUSTICS.

THE Science of Acoustics, called alſo, Phonics, comprehends every thing relative to the nature, operation, and effects of Sound. Some authors divide it into two branches, and entitle that which treats of the properties of ſounds that come directly to the ear, Diacoustics, and that which illuſtrates the nature of reflected ſounds, Catacoustics; but theſe diſtinctions do not appear to be of any real importance. In treating of this ſubject, we ſhall give a conciſe view

I. Of the Different Theories of Sound.

II. Of the Velocity of Sound.

III. Of the Reverberation of Sound; and

IV. Of the Entertaining Experiments that have been made with Sound.

Sect. I. *Of the* Different Theories *of* Sound.

That Air is the principal vehicle of Sound, is univerſally allowed; and that, without the medium of it, or ſome other fluid, we ſhould have no ſounds at all, is proved by the experiment of a receiver, exhauſted of its air, by an air-pump, where a bell, rung in the vacuum, makes no ſound whatever.

Some philoſophers indeed have aſſerted, that air is the *only* vehicle of ſound; an opinion which ſeems to be diſproved by the experiments that have been made in water, through which ſounds are conveyed almoſt as eaſily as through air; for a bell rung in the water ſounds as diſtinctly as in air; and Mr. Derham remarks, that the tone comes a quarter deeper. On the other hand, however, it may be urged, that experiments of this kind are not quite concluſive, as theſe ſounds reach our ears from the water, through the medium of the air. What appears to be a more deciſive proof, that water is a vehicle of ſound, is that Fiſhes are endued with auricular organs, as has been demonſtrated by the late great anatomiſt, Mr. John Hunter, which would not be the caſe, if water were not a vehicle of ſound. Mr. Hunter affirms, that they have a ſtrong perception of ſound even at the bottom of deep rivers.

Elaſticity, therefore, in the conveying vehicle, ſeems not to be an eſſential requiſite for the propagation of ſounds; for all the ſubſtances we are acquainted with, water is, the leaſt elaſtic; although, if we make allowance for its ſuperior denſity, ſound moves in it with a velocity proportioned to what it does in air. But whether the vehicle of ſound be elaſtic or otherwiſe, philoſophers in general agree, that ſound is ſolely occaſioned by the impreſſion made upon air or water, by an elaſtic body, and carried to the organ of hearing by either or both of theſe fluids. That neither of them, however, is a vehicle of ſound, by itſelf, ſeems to be paſt a doubt. For it is certain, that ſounds can be propagated through wood or metals, even more readily than through air or water. Even deaf people may be made ſenſible or ſounds by holding a piece of metal in their mouths, one end of which is applied to the ſounding body. As air cannot penetrate metals, the electrical fluid, which is univerſally diffuſed through all nature, muſt be acknowledged to be the medium of ſound; and that while it is entangled in the particles of air, water, wood, metal &c. whatever affects theſe muſt affect it, and produce ſound; which cannot be produced in an exhauſted receiver, where the electric fluid is free from all other matter whatſoever.

Philoſophers, however, are much divided in their opinions reſpecting the MANNER in which ſound is conveyed to the ear; *i. e.* Whether it is diffuſed in the air, or in a circular or undulatory manner, like the waves occaſioned in a ſmooth water, by throwing in a ſtone: or whether it runs in ſtraight lines, like the rays of light diffuſed from a centre, in the manner that the electrical fluid runs along a rod of iron. Sir Iſaac Newton adopted the former theory, and illuſtrated the propagation of ſound by an undulatory, or rather *vermicular* motion in the particles of the air, drawn from the familiar inſtance of the crawling of a worm, which firſt carries its contractions from the hinder part, to throw its fore part to the proper diſtance, and then carries them back to bring the hinder part forward. Something ſimilar to this takes place in the air, when agitated by the percuſſion of a ſounding body: and thus he ſuppoſes there is an alternate condenſation and relaxation of the air during one vibration: and as the air in its progreſs forward ſtrikes an oppoſing body with greater force, than in its retrogradation, Sir Iſaac entitles each of theſe accellerated progreſſions a PULSE *of* SOUND: and as all motion upon fluids, in any direction, operates more or leſs, in a circular or ſpherical manner all around, ſo theſe ſounds will be driven in all directions forward, backward, upward, downward, and on every ſide, like circles in diſturbed water. An idea of the rules of ſound, according to this hypotheſis, may be formed from obſerving the tone of a church bell, while its ſounds are dying away, and which are owing to the alternate progreſſion and receſſion of the air; for as each of theſe pulſations is formed by a ſingle vibration of the ſtring, they muſt be equal to each other, as theſe vibrations are known to be.

As to the velocity with which ſounds travel, (which will be more particularly treated of in Sect. II.) Newton determines it, by the moſt difficult calculation that can be imagined, to be in proportion to the thickneſs of the parts of the air, and the diſtance of theſe parts from each other. He proves that each little part moves backward and forward like a pendulum; and demonſtrates, that if the atmoſphere were of the ſame denſity every where as at the ſurface of the earth, a pendulum that reached from its higheſt ſurface down to the ſurface of the earth, would by its vibrations diſcover to us the proportion of the velocity with which ſounds travel. The velocity with which each pulſe would move, he ſhows, would be as much greater than the velocity of ſuch a pendulum ſwinging with one complete vibration, as the circumference of a circle is greater than the diameter. From hence he calculates, that the motion of ſound will be 979 feet in one ſecond. But this not being conſonant to experience, he takes in another conſideration, which remove the rigour of his former demonſtration, namely, vapors in the air; and then finds the motion of the ſound to be 1142 feet in one ſecond, or near thirteen miles in a minute: a proportion which experience had eſtabliſhed nearly before. Thus much will ſerve to give an idea of a theory which has met with numbers of oppoſers.

Various have been the objections that have been made to the Newtonian ſyſtem of ſounds. It is urged, that this theory can only agree with the motion of ſound in an elaſtic fluid, whereas ſounds are known to move forward thro' water that is not elaſtic. To explain their progreſs, therefore, through water, a ſecond theory muſt be formed: ſo that two theories muſt be made to explain a ſimilar effect; which is contrary to the ſimplicity of true philoſophy: for it is contrary to the ſimplicity of nature. It is further urged, that the ſlow vermicular motion but ill repreſents the velocity with which ſounds travel, as we know by experience, that it is almoſt thirteen miles in a minute. In ſhort, it is urged, that ſuch undulations as have been deſcribed, when coming from ſeveral ſonorous bodies at once, would croſs, obſtruct, and confound each other; ſo that, if they were conveyed to the ear by this means, we ſhould hear nothing but a medly of diſcord and broken articulations. But this is equally with the reſt contradictory to experience, ſince we hear the fulleſt concert, not only without confuſion, but with the higheſt pleaſure, and a correct ear inſtantly detects the error of a ſingle note in a full band. Theſe objections have given riſe to another theory.

Every ſound may be conſidered as driven off from the ſounding body in ſtraight lines, and impreſſed upon the air in one direction only; but whatever impreſſion is made upon a fluid in one direction, is diffuſed upon its ſurface into all directions; ſo that the ſound firſt driven directly forward ſoon fills up a wide ſphere and is heard on every ſide. Thus, as it is impreſſed, it inſtantaneouſly travels forward with a very ſwift motion, reſembling the velocity with which we know electricity flies from one end of a line to another. Now, as to the pulſes, or cloſe ſhakes as the muſicians expreſs it, which a ſounding body is known to make, each pulſe (ſay the ſupporters of this theory) is itſelf a diſtinct and perfect ſound, and the interval between every two pulſes is profoundly ſilent. Continuity of ſound from the ſame body is only a deception of the hearing; for as each diſtinct ſound ſucceeds at very ſmall intervals the organ has no time to tranſmit its images with equal ſwiftneſs to the mind, and the interval is thus loſt to ſenſe; juſt as in ſeeing a flaming torch, if ſtared round in a circle, it appears as a ring of fire, or when children run with their ſticks along a railing, a continuing ſound is thus repreſented, though it need ſcarce be obſerved that the ſtroke againſt each rail is perfectly diſtinct. According to this theory, therefore, the pulſes are nothing more than diſtinct ſounds repeated by the ſame body, the firſt ſtroke or vibration being ever the loudeſt, and travelling farther than thoſe that follow; while each ſucceeding vibration gives a new ſound, but with diminiſhed force, till at laſt the pulſes decay away totally, as the force decays that gives them exiſtence. Some wanting elaſticity, give back no repetition of ſound; the noiſe is at once begotten and dies: while other bodies, more elaſtic, and capable of vibration, give back a ſound, and repeat it ſeveral times ſucceſſively. Theſe laſt are ſaid to have a *tone*.

This tone of the elaſtic ſtring, or bell, is notwithſtanding nothing more than a ſimilar ſound of what the former bodies produced, but with the difference of being many times repeated. Let us now ſuppoſe that by ſwift and continued ſtrokes we give a non-elaſtic body its tone: it is very obvious, that no alterations will be made in this tone by the quickneſs of the ſtrokes, though repeated ever ſo faſt.

Theſe will only render the tone more equal and continuous, but make no alteration in the force of each blow, a different tone will then undoubtedly be excited. The difference will be ſmall, for the tones of inflexible bodies are capable but of ſmall variation; however, there will certainly be a difference, for in two equal non-elaſtic bodies, that body produces the deepeſt tone which is ſtruck by the greateſt blow

We now come to a critical queſtion: What is it that produces the difference of tone in two elaſtic ſounding bells or ſtrings? Or what makes one deep and the other ſhrill? This queſtion has always been hitherto anſwered, by ſaying, that the depth or height of the note proceeded from the ſlowneſs or ſwiftneſs of the times of the vibrations. The ſloweſt vibrations, it has been ſaid, are qualified for producing the deepeſt tones; while the ſwifteſt vibrations produce the higheſt tones. In this caſe, an effect has been given for a cauſe. It is, in fact, the force with which the ſounding ſtring ſtrikes the air when ſtruck upon, that makes the true diſtinction in the tones of ſounds. It is this force, with greater or leſs impreſſions, reſembling the greater or leſs force of the blows upon a non-elaſtic body, which produces correſpondent affections of ſound. The greateſt forces produce the deepeſt ſounds: the high notes are the effect of ſmall efforts. In the ſame manner a bell, wide at the mouth, gives a grave ſound; but if it be very maſſy withal, that will render it ſtill graver; but if maſſy, wide, and long, or high, that will make the tone deepeſt of all. Thus, then, will elaſtic bodies give the deepeſt ſound, in proportion to the force with which they ſtrike the air: but if we ſhould attempt to increaſe the force by giving them a ſtronger blow, this will be in vain; they will return the ſame tone; for ſuch is their formation, that they are ſonorous only becauſe they are elaſtic, and the force of the elaſticity is not increaſed by our ſtrength, as the greatneſs of a pendulum's vibration will not be increaſed by falling from a greater height. Thus far of the length of chords. As to the frequency with which they vibrate the deepeſt tones, it has been found, from the nature of the elaſtic ſtrings, that the longeſt ſtrings have the wideſt vibrations, and conſequently go backward and forward ſloweſt; while, on the contrary, the ſhorteſt ſtrings vibrate the quickeſt, or come and go in the ſhorteſt intervals. From hence thoſe who have treated of ſounds, have aſſerted, that the tone of the ſtring muſt depend upon the length or ſhortneſs of the vibrations. This, however, is not the caſe. One and the ſame ſtring, when ſtruck, muſt always, like the ſame pedulum, return preciſely ſimilar vibrations; but it is well known, that one and the ſame ſtring, when ſtruck upon, does not always return preciſely the ſame tone: ſo that in this caſe the vibrations follow one rule, and the tone another. The vibrations muſt be invariably the ſame in the ſame ſtring, which does not return the ſame tone invariably, as is well known to muſicians in general. In the violin, for inſtance, they can eaſily alter the tone of the ſtring an octave, or eight note higher, by a ſofter method of drawing the bow; and ſome are known thus to bring out the moſt charming airs imaginable. Theſe peculiar tones are by muſicians called *flute-notes.* The only reaſon, it has been alledged, that can be aſſigned for the ſame ſtring thus returning different tones, muſt certainly be the different force of its ſtrokes upon the air. In one caſe it has double the tone of the other; becauſe upon the ſoft touches of the bow, only half its elaſticity is put into vibration. This being underſtood, (continue the authors of this theory,) we ſhall be able clearly to account for many things relating to ſounds that have hitherto been inexplicable. Thus, for inſtance, if it be aſked, when two ſtrings are ſtretched together of equal lengths, tenſions, and thickneſs, how does it happen, that one of them being ſtruck, and made to vibrate throughout, the other ſhall vibrate throughout alſo? the anſwer is obvious: the force that the ſtring ſtruck receives is communicated to the air, and the air communicates the ſame to the ſimilar ſtring; which therefore receives all the force of the former; and the force being equal, the vibrations muſt be ſo too. Again, put the queſtion, If one ſtring be but half the length of the other, and be ſtruck, how will the vibrations be? The anſwer is, the longeſt ſtring will receive all the force of the ſtring half as long as itſelf, and therefore it will vibrate in proportion; that is, through half its length. In the ſame manner, if the longeſt ſtring were three times as long as the other, it would only vibrate in a third of its length; or if four times, in a fourth of its length. In ſhort, whatever force the ſmaller ſtring impreſſes upon the air, the air will impreſs a ſimilar force upon the longer ſtring, and partially excite its vibrations. From hence alſo we may account for the cauſe of thoſe charming, melancholy gradations of ſound in the Eolian lyre; an inſtrument deſcribed a century ago by Kircher. See Pl. III. Fig. 2. That inſtrument is eaſily made, being nothing more than a long narrow box of thin deal, about thirty inches long, five inches broad, and one and three quarters of an inch deep, with a circle in the middle of the upper ſide, or belly, about one inch and a half diameter, pierced with ſmall holes. On this ſide are ſeven, ten, or (according to Kircher) fifteen or more ſtrings of very fine gut, ſtretched over bridges at each end, like the bridge of a fiddle, and ſcrewed up or relaxed with ſcrew-pins. The ſtrings are all tuned to one and the ſame note, and the inſtrument is placed in ſome current of air, where the wind can bruſh over its ſtrings with freedom. A window, with the ſaſh juſt raiſed to give the air admiſſion, will anſwer this purpoſe exactly. Now, when the entering air blows upon theſe ſtrings with different degrees of force, there will be excited different tones of ſound: ſometimes the blaſt brings out all the tones in full concert; ſometimes it ſinks them to the ſofteſt murmurs: it feels for every tone; and, by its gradations of ſtrength, ſolicits thoſe gradations of ſound which art has taken different methods to produce. See Hawkin's Hiſt. of Music.

It remains, in the laſt place to conſider (by this theory) the loudneſs and lowneſs, or, as the muſicians ſpeak, the ſtrength and ſoftneſs, of ſound. In vibrating elaſtic ſtrings, the loudneſs of the tone is in proportion to the deepneſs of the note; that is, in two ſtrings, all things in other circumſtances alike, the deepeſt tone will be the loudeſt. In muſical inſtruments upon a different principle, as in the violin, it is otherwiſe; the tones are made in ſuch inſtruments by a number of ſmall vibrations crowded into one ſtroke. The roſined bow, for inſtance, being drawn along a ſtring, its roughneſſes catch the ſtring at very ſmall intervals, and excite its vibrations. In this inſtrument, therefore, to excite loud tones, the bow muſt be drawn quick, and this will produce the greateſt number of vibrations. But it muſt be obſerved, that, the more quick the bow paſſes over the ſtring, the leſs apt will the roughneſs of its ſurface be to touch the ſtring at every inſtant. To remedy this, therefore, the bow muſt be preſſed the harder as it is drawn quicker, and thus its fulleſt ſound will be brought from the inſtrument. If the ſwiftneſs of the vibrations, in an inſtrument thus rubbed upon, exceed the force of the deeper ſound in another, then the ſwift vibrations will be heard at a greater diſtance, and as much farther off as the ſwiftneſs in them exceeds the force in the other.

By the ſame theory (it is alledged) may all the phenomena of muſical ſounds be eaſily explained. The fables of the ancients pretend, that muſic was firſt found out by the beating of different hammers upon the ſmith's anvil. Without purſuing the fable, let us endeavour to explain the nature of muſical ſounds by a ſimilar method. Let us ſuppoſe an anvil, or ſeveral ſimilar anvils, to be ſtruck upon by ſeveral hammers of different weights or forces. The hammer, which is double that of another, upon ſtriking the anvil, will produce a ſound double that of the other. This double ſound muſicians have agreed to call an octave. The ear can judge of the difference or reſemblance of theſe ſounds with great eaſe, the numbers being as one and two, and therefore very readily compared. Suppoſe that an hammer, three times leſs than the firſt, ſtrikes the anvil, the ſound produced by this will be three times leſs than the firſt: ſo that the ear, in judging the ſimilitude of theſe ſounds, will find ſomewhat more difficulty; becauſe it is not ſo eaſy to tell how often one is contained in three, as to tell how often it is contained in two. Again, ſuppoſe that an hammar four times leſs than the firſt; ſtrikes the anvil, the ear will find greater difficulty ſtill in judging preciſely the difference of the ſounds; for the difference of the numbers four and one cannot ſo ſoon be determined with preciſion as three and one. If the hammer be five times leſs, the difficulty of judging will be ſtill greater. If the hammer be ſix times leſs, the difficulty ſtill increaſes; and ſo alſo of the ſeventh; inſomuch, that the ear cannot always readily, and at once, determine the preciſe gradation. Now, of all compariſons, thoſe which the mind makes moſt eaſily, and with leaſt labour, are the moſt pleaſing. There is a certain regularity in the human ſoul, by which it finds pleaſure in exact and ſtriking, and eaſily made compariſons. As the ear is but an inſtrument of the mind, it is therefore moſt pleaſed with the combination of any two ſounds, the differences of which it can moſt readily diſtinguiſh. It is more pleaſed with the concord of two ſounds which are to each other as one and three, or one and four, or one and five, or one and ſix or ſeven. Upon this pleaſure, which the mind takes in compariſon, all harmony depends. The variety of ſounds is infinite; but becauſe the ear cannot compare two ſounds ſo as readily to diſtinguiſh their diſcriminations when they exceed the proportion of one and ſeven, muſicians have been content to confine all harmony within that compaſs, and allowed but ſeven notes in muſical compoſition.

Let us then ſuppoſe a ſtringed inſtrument fitted up in the order mentioned above. For inſtance: let the firſt ſtring be twice as long as the ſecond; let the third ſtring be three times ſhorter than the firſt; let the fourth be four times, the fifth ſtring five times, and the ſixth ſix times as ſhort as the firſt. Such an inſtrument would probably give us a repreſentation of the lyre, as it came firſt from the hands of the inventor. This inſtrument will give us all the ſeven notes following each other in the order in which any two of them will accord together moſt pleaſingly: but it will be a very inconvenient, and a very diſagreeable inſtrument: inconvenient, becauſe in a compaſs of ſeven ſtrings only, the firſt muſt be ſeven times as long as the laſt; and diſagreeable, becauſe this firſt ſtring will be ſeven times as loud alſo; ſo that when the tones are to be played in a different order, loud and ſoft ſounds will be intermixed with the moſt diſguſting alternations. In order to improve the firſt inſtrument, therefore, ſucceeding muſicians judiciouſly threw in all the other ſtrings between the two firſt; or, in other words, between the two octaves, giving to each, however, the ſame proportion to what it would have had in the firſt natural inſtrument. This made the inſtrument more portable, and the ſounds more even and pleaſing. They therefore diſpoſed the ſounds between the octave in their natural order, and gave each its own proportional dimenſions. Of theſe ſounds, where the proportion between two of them is moſt obvious, the concord between them will be moſt pleaſing. Thus octaves, which are as two to one, have a moſt harmonious effect; the fourth and fifth alſo ſound melodiouſly together; and they will be found upon calculation, to bear the ſame proportion to each other that octaves do.

But there is another property in the vibration of a muſical ſtring not yet taken notice of, and which confirms the foregoing theory. If we ſtrike the ſtring of an harpſichord, or any other elaſtic ſounding chord whatever, it returns a continuing ſound. This till of late was conſidered as one uniform tone; but all muſicians now confeſs, that inſtead of one tone, it actually returns four tones, and that conſtantly. The notes are, beſide the fundamental tone, an octave above, a twelfth above, and a ſeventeenth. One of the baſs notes of an harpſichord has been diſſected in this manner by Rameau, and the actual exiſtence of theſe tones proved beyond the poſſibility of being controverted. In fact, the experiment is eaſily tried: for if we ſmartly ſtrike one of the lower keys of an harpſichord, and then take the finger briſkly away, an ear even moderately familiar with muſical ſounds will be able to diſtinguiſh, that, after the fundamental tone has ceaſed, three other ſhriller tones will be diſtinctly heard: firſt the octave above, then the twelfth, and laſtly the ſeventeenth. The octave above is, in general, almoſt mixed with the fundamental tone, ſo as not to be eaſily perceived, except by an ear long accuſtomed to the minute diſcriminations of ſounds. So that we may obſerve, that the ſmalleſt tone is heard laſt, and the deepeſt and largeſt tone firſt; the two others in order.

This theory of ſtringed inſtruments, though generally juſt, is not yet wholly correct; ſince there appears to be no conſideration in the firſt place of the relative tenſion of the ſtrings whoſe length is in arithmetical progreſſion; and in the ſecond place, the theory ſuppoſes the ſtrings to be extended from the ſides of an angle, admitting of ſuch a relative length. Unqueſtionably the ſtrings of an inſtrument ſo formed, whoſe tenſion ſhould be equal, would ſtill poſſeſs different degrees of elaſticity; and what is equally certain, the ſounds would be neither octaves nor any other harmonical concords, any more than ſtrings of equal lengths but of different and irregular tenſion. The true harmonical concord is founded on a diſtinct principle, and it is not of modern invention or diſcovery, as is ſhewn in the coſtruction of the lyre, commonly known by the name of the Iriſh harp. See **Harp.** In a work publiſhed a few years ſince, entitled "an hiſtory of the Iriſh bards," is ingeniouſly developed the curious fact, that the line of muſical harmony is preciſely the ſame as the line of beauty, and that the dulcet ſounds of the harp, which have for ſo many ages charmed the ear, are entirely owing to this ſimple principle, that the ſtrings inſtead of iſſuing from two ſtraight ſides of a triangle, muſt in order to be harmonical, iſſue from one ſtraight ſide of the triangle and terminate in a line forming a curve; this curve, as has been ſhewn, is founded on mathematical principles, and is completely illuſtrated in the work alluded to, which alſo ſhews that the chromatic ſcale of muſic, heretofore held to be of modern invention, was underſtood, by the ancient Iriſh, as well as the diatonic. In the conſtruction of the harpſichord, this principle has inſenſibly approached the mathematical rules, without any preſuppoſition of its exiſtence; for we find that artiſts have given the bridge or reſt of their ſtrings an irregular curvature, merely governed by the ear or an experience of the ſtrings breaking more frequently from the neceſſity that has been found of increaſing the tenſion of certain ſtrings on the ſtraight line; the high notes, in particular, in harpſichords exhibit a clear view of this principle; though it will be found that few inſtrument-makers can aſſign any other rule than cuſtom for the practice.

The theory of the ſtraight lines, however, will ſufficiently explain the principle of muſical ſounds to a perſon not deſirous of ſcientific accuracy; to the reader ſolicitous of that degree of ſkill, the works of Roſſeau, and Burney on Muſic, will be indeſpenſibly requiſite, and the above work, containing the principles and a more ſatisfactory illuſtration of the harp than any that has been publiſhed, will be uſeful.

In the whole theory of ſounds, nothing has given greater room for ſpeculation, conjecture, and diſappointment, than this amazing property in elaſtic ſtrings. The whole ſtring is univerſally acknowledged to be in vibration in all its parts, yet this ſingle vibration returns no leſs than four different ſounds. Thoſe, who account for the tones of ſtrings by a number of their vibrations, are here at the greateſt loſs. Daniel Bernouilli ſuppoſes, that a vibrating ſtring divides itſelf into a number of curves, each of which has a peculiar vibration; and though they all ſwing together in the common vibration, yet each vibrates within itſelf. This opinion which was ſupported, as many geometrical ſpeculations are, with the parade of ſpecious demonſtration, was only born ſoon after to die. Others have aſcribed this to an elaſtic difference in the parts of the air, each of which at different intervals, thus received different impreſſions from the ſtring, in proportion to their elaſticity. This is abſurd. If we allow the difference of tone to proceed from the force, and not the frequency of the vibrations, this difficulty will admit of an eaſy ſolution. Theſe ſounds, though they ſeem to exiſt together in the ſtring, actually follow each other in ſucceſſion: while the vibration has greateſt force, the fundamental tone is brought forward: the force of the vibration decaying, the octave is produced, but almoſt only inſtantaneouſly; to this ſucceeds, with diminiſhed force, the twelfth; and laſtly, the ſeventeenth is heard to vibrate with great diſtinctneſs, while the three other tones are, always ſilent. Theſe ſounds, thus excited, are all of them the harmonic tones, whoſe differences from the fundamental tone are, as was ſaid, ſtrong and diſtinct. On the other hand, the diſcordant tones cannot be heard. The differences being but very ſmall, they are overpowered, and in a manner drowned in the tones of ſuperior difference: yet not always neither; for Daniel Bernouilli has been able, from the ſame ſtroke, to make the ſame ſtring bring out its harmonic and its diſcordant tones alſo. Vid. Memoires de l'Academie de Berlin, 1753, p. 153. So that from hence we may juſtly infer, that every note whatſoever is only a ſucceſſion of tones; and that thoſe are moſt diſtinctly heard, whoſe differences are moſt eaſily perceivable. To this theory, however, though it has a plauſible appearance, there are ſtrong and indeed inſuperable objections. The very fundamental principle of it is falſe. No body whatever, whether elaſtic or non-elaſtic, yields a graver ſound by being ſtruck with a larger inſtrument, unleſs either the ſounding body, or that part of it which emits the ſound, is enlarged. In this caſe, the largeſt bodies always return the graveſt ſounds. In ſpeaking of elaſtic and non-elaſtic bodies in a muſical ſenſe, we are not to puſh the diſtinction ſo far as when we ſpeak of them philoſophically. A body is *muſically* elaſtic, all of whoſe parts are thrown into vibrations ſo as to emit a ſound when only part of the ſurface is ſtruck. Of this kind are bells, muſical ſtrings, and all bodies whatever that are conſiderably hollow. Muſical non-elaſtics are ſuch bodies as emit a ſound only from the particular place which is ſtruck: thus, a table, a plate of iron nailed on wood, a bell ſunk in the earth, are all of them non-elaſtics in a muſical ſenſe, though not philoſophically ſo. When a ſolid body, ſuch as a log of wood, is ſtruck with a ſwitch, only that part of it emits a ſound which comes in contact with the ſwitch, the note is acute and loud, and would be no leſs ſo though the adjacent parts of the log were removed. If, inſtead of the ſwitch, a heavier or larger inſtrument is made uſe of, a larger portion of its ſurface then returns a ſound, and the note is conſequently more grave: but it would not be ſo, if the large inſtrument was ſtruck with a ſharp edge, or a ſurface only equal to that of the ſmall one. In ſounds of this kind, where there is only a ſingle ſtroke, without any repetition, the immediate cauſe of the gravity or acuteneſs ſeems to be the quantity of air diſplaced by the ſounding body: a large quantity of air diſplaced produces a grave ſound, and a ſmall quantity a more acute one, the force wherewith the air is diſplaced ſignifying very little.

The argument grounded on the production of what are called *flute-notes* on the violin, is built on a falſe foundation; for the bow being lightly drawn on an open ſtring, produces no *flute-notes*, but only the harmonies of the note to which the ſtring is tuned. The *flute-notes* are produced by a particular motion of the bow, quick and near the bridge, and by fingering very gently. By this management, the ſame ſounds are produced, though at certain intervals only, as if the vibrations were transferred to the ſpace between the end of the finger-board and the finger inſtead of that between the finger and the bridge. Why this ſmall part of the ſtring ſhould vibrate in ſuch a caſe, and not that which is under the immediate action of the bow, we muſt own ourſelves ignorant: nor dare we affirm that the vibrations really are transferred in this manner, only the ſame ſounds are produced as if they were.

Though theſe objections ſeem ſufficient to overturn the foregoing theory, with regard to acute ſounds being the effects of weak ſtrokes, and grave ones of ſtronger impulſes, we cannot admit that longer or ſhorter vibrations are the occaſion of gravity or acuteneſs in ſound. A muſical ſound, however, lengthened, either by ſtring or bell, is only a repetition of a ſingle one, whoſe duration by itſelf is but for a moment, and is therefore termed *inappretiable*, like the ſmack of a whip, or the exploſion of an electrical battery. The continuation of the ſound is nothing more than a repetition of this inſtantaneous inappretiable noiſe after the manner of an echo, and it is only this echo that makes the ſound agreeable. For this reaſon, muſic is much more agreeable when played in a large hall, where the ſound is reverberated, than in a ſmall room, where there is no ſuch reverberation. For the ſame reaſon, the ſound of a ſtring is more agreeable when put on a hollow violin, than when faſtened to a plain board, &c. In the ſound of a bell we cannot avoid obſerving this echo very diſtinctly. The ſound appears to be made up of diſtinct pulſes, or repetitions of the ſame note produced by the ſtroke of the hammer. It can by no means be allowed, that the note would be more acute though theſe pulſes were to ſucceed one another more rapidly; the ſound would indeed become more ſimple, but reverberations are vaſtly more quick than in bells; and therefore their ſound is more uniform or ſimple, and conſequently more agreeable than that of bells. In muſical glaſſes, the vibration muſt be inconceivably quicker than in any bell, or ſtringed inſtrument: and hence they are of all others the moſt ſimple and the moſt agreeable, though neither the moſt acute nor the loudeſt. As far as we can judge, quickneſs of vibration contributes to the uniformity; or ſimplicity, but not the acuteneſs, nor the loudneſs of a muſical tone.

It may here be objected, that each of the different pulſes, of which we obſerve the ſound of a bell to be compoſed, is of a very perceptible length, and far from being inſtantaneous; ſo that it is not fair to infer that the ſound of a bell is only a repetition of a ſingle inſtantaneous ſtroke, ſeeing it is evidently the repetition of a lengthened note. To this it may be replied, that the inappretiable ſound, which is produced by ſtriking a bell in a non-elaſtic ſtate, is the very ſame, which being firſt propagated round the bell, forms one of theſe ſhort pulſes that is afterwards re-echoed as long as the vibrations of the metal continue, and it is impoſſible that the quickneſs of repetition of any ſound can either increaſe or diminiſh its gravity.

SECT. II. *Of the* VELOCITY, *&c. of* SOUND. AXIOMS.

EXPERIENCE has taught us that ſound travels at about the rate of 1142 feet in a ſecond, or near 13 miles in a minute, nor do any obſtacles hinder its progreſs, a contrary wind only a ſmall matter diminiſhing its velocity. The method of calculating its progreſs is eaſily underſtood. When a gun is diſcharged at a diſtance, we ſee the fire long before we hear the ſound. If then we know the diſtance of the place, and know the time of the interval between our firſt ſeeing the fire and hearing the report, it will ſhow us exactly the time the ſound has been in travelling to us. For inſtance, if the gun is diſcharged a mile off, the moment the flaſh is ſeen, if you take a watch, and count the ſeconds till you hear the ſound, the number of ſeconds is the time the ſound has been travelling a mile. Again, by the above axiom, we are enabled to find the diſtance between objects that would be otherwiſe immeaſurable. For example, ſuppoſe you ſee the flaſh of a gun in the night at ſea, and tell ſeven ſeconds before you hear the report, it follows therefore, that the diſtance is ſeven times 1142 feet, that is 24 yards more than a mile and a half. In like manner, if you obſerve the number of ſeconds between the lightning and the report of thunder, you know the diſtance of the cloud from whence it proceeds.

Derham has proved, by experiment, that all ſounds whatever travel at the ſame rate. The ſounding of a gun, and the ſtriking of a hammer, are equally ſwift in their motions; the ſofteſt whiſper flies as ſwiftly, as far as it goes, as the loudeſt thunder.

To theſe axioms we may add the following: Smooth and clear ſound proceeds from bodies that are homogeneous, and of an uniform figure: and harſh or obtuſe ſounds, from ſuch as are of a mixed matter and irregular figure.

The velocity of ſound is to that of a briſk wind as fifty to one.

The ſtrength of ſounds is greateſt in cold and denſe air, and leaſt in that which is warm and rarified.

Every point againſt which the pulſes of ſound ſtrikes, becomes a centre from which a new ſeries of pulſes are propagated in every direction. Sound deſcribes equal ſpaces in equal times.

SECT. III. *Of* REVERBERATED SOUNDS.

SOUND, like light, after it has been reflected from ſeveral places, may be collected in one point, as into a focus; and it will be there more audible than in any other part, even than at the place from whence it proceeded. On this principle it is that a whiſpering gallery is conſtructed. The form of this gallery muſt be that of a concave hemiſphere; and if a low ſound or whiſper be uttered, the vibrations expanding themſelves, when brought to a point, the ſound will be diſtinctly heard. See Plate III. Fig. 3.

The augmentation of ſound by means of ſpeaking trumpets is very conſiderable. See Fig. 4. When a perſon ſpeaks thro' a trumpet, the whole force of his voice is ſpent upon the air contained in the tube, which will be agitated through the whole length of it; and, by various reflections from the ſide of the tube to the axis, the air along the middle part of the tube will be greatly condenſed, and its *momentum* proportionably increaſed, ſo that when it comes to agitate the air at the orifice of the tube, its force will be as much greater than it would have been without the tube, as the ſurface of a ſphere, whoſe radius is equal to the length of the tube, is greater than the ſurface of the ſegment of ſuch a ſphere, whoſe baſe is the orifice of the tube. For a perſon ſpeaking without the tube, will have the force of his voice ſpent

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exciting concentric ſuperficies of air all around the mouth the trumpet : and when thoſe ſuperficies or pulſes of air e diffuſed, it is plain the force of the voice will there alſo diffuſed through the whole ſuperficies of a ſphere ; but the trumpet it will be ſo confined, that at its exit it will diffuſed through ſo much of that ſpherical ſurface of air correſponds to the orifice of the tube. But ſince the rce is given, its intenſity will be always inverſely as the mber of particles it has to move ; and therefore in the be it will be to that without, as the ſuperficies of ſuch a here to the area of the large end of the tube nearly. But is obvious (Mr. Young, of Dublin obſerves) that the con- iement of the voice can have little effect in increaſing the ength of the ſound, as this ſtrength depends on the velo- ty with which the particles move. Were this reaſoning nclusive, the voice ſhould iſſue through the ſmalleſt poſſi- e orifice ; cylindrical tubes would be preferable to any that creaſe in diameter ; and the leſs the diameter the greater ould be the effect of the inſtrument ; becauſe the plate or aſs of air to be moved, would, in that caſe, be leſs, and nſequently the effect of the voice the greater ; all which contradicted by experience. The cauſe of the increaſe ſound in theſe tubes muſt therefore be derived from ſome her principles ; and amongſt theſe we ſhall probably find, at what the ingenious Kircher has ſuggeſted, in his Pho- rgia is the moſt deſerving of our attention. He tells us, at "the augmentation of ſound depends on its reflection om the tremulous ſides of the tube ; which reflections con- iring in propagating the pulſes in the ſame direction, muſt creaſe its intenſity." Newton alſo ſeems to have con- dered this as the principal cauſe, in the ſcholium of prop. 0. B. 2. Princip. when he ſays, "we hence ſee why ſounds e ſo much increaſed in ſtentorophonic tubes, for every eciprocal motion is, in each return, increaſed by the gene- ting cauſe."

Farther, when we ſpeak in the open air, the effect on the mpanum of a diſtant auditor is produced merely by a ſingle ulſe. But when we uſe a tube, all the pulſes propagated om the mouth, except thoſe in the direction of the axis, rike againſt the ſides of the tube, and every point of im- ulſe becoming a new centre, from whence the pulſes are ropagated in all directions, a pulſe will arrive at the ear rom each of thoſe points ; thus, by the uſe of a tube, a reater number of pulſes are propagated to the ear, and onſequently the ſound increaſed. The confinement too of he voice may have ſome effect, though not ſo much as is ſcribed to it by ſome ; for the condenſed pulſes produced y the naked voice freely expand every way, but in tubes, e lateral expanſion being diminiſhed, the direct expan- on will be increaſed, and conſequently the velocity of the articles, and the intenſity of the ſound. The ſubſtance ſo of the tube has its effect; for it is found, by experi- ent, that the more elaſtic the ſubſtance of the tube, and con- quently the more ſuſceptible it is of theſe tremulous mo- ons, the ſtronger is the ſound. If the tube be laid on ny non-elaſtic ſubſtance, it deadens the ſound, becauſe it revents the vibratory motion of the parts. The ſound is creaſed in ſpeaking trumpets, if the tube be ſuſpended in e air : becauſe the agitations are then carried on without terruption. Theſe tubes ſhould increaſe in diameter from the outhpiece ; becauſe the parts, vibrating in directions perpendicular to the ſurface, will conſpire in impelling velocity, will increaſe the intenſity of the ſound : and the ſurface alſo increaſing, the number of points of impulſe and of new propagations will increaſe proportionally. The ſeveral cauſes, therefore, of the increaſe of ſounds in theſe tubes, Mr. Young concludes to be, 1. The diminution of the lateral, and conſequently the increaſe of the direct, expanſion and velocity of the included air. 2. The increaſe of the number of pulſes, by increaſing the points of new propagation. 3. The reflections of the pulſes from the tremulous ſides of the tube, which impel the particles of air forward, and thus increaſe their velocity.

An echo is a reflection of ſound ſtriking againſt ſome object, as an image is reflected in a glaſs : but it has been diſputed what are the proper qualities in a body for thus reflecting ſounds. It is in general known, that caverns, grottos, mountains, and ruined buildings, return this image of ſound. We have heard of a very extraordinary echo, at a ruined fortreſs near Louvain, in the department of Dyle, in France. If a perſon ſung, he only heard his own voice without any repetition : on the contrary, thoſe who ſtood at ſome diſtance, heard the echo, but not the voice ; but then they heard it with ſurpriſing variations, ſometimes louder, ſometimes ſofter, now more near, then more diſtant. There is an account in the Memoirs of the old French Academy of a ſimilar echo near Rouen, in the preſent department of the lower Seine.

As there may be ſeveral ſphæroids of different magnitudes, ſo there may be ſeveral different echoes of the ſame original ſound. And as there may happen to be a greater number of reflecting points in the ſurface of an exterior ſphæriod than in that of an interior, a ſecond or a third echo may be much more powerful than the firſt, provided that the ſuperior number of reflecting points, that is, the ſuperior number of reflected pulſes propagated to the ear, be more than ſufficient to compenſate for the decay of ſound which ariſes from its being propagated through a greater ſpace. This is finely illuſtrated in the celebrated echoes at the lake of Killarney, in Ireland, where the firſt return of ſound is much inferior in ſtrength to thoſe which immediately ſucceed it.

In large churches we never hear a diſtinct echo of the voice but a confuſed ſound, when the ſpeaker utters his words too rapidly ; becauſe the greateſt difference of diſtance between the direct and reflected courſes of ſuch a number of pulſes, as would produce a diſtinct ſound, is never in any church equal to 127 feet, the limit of echoes. But though the firſt reflected pulſes may produce no echo, both on account of their being too few in number, and too rapid in their return to the ear ; yet it is evident, that the reflecting ſurface may be ſo formed, as that the pulſes which come to the ear after two reflections, or more, may, after having deſcribed 127 feet, or more, arrive at the ear in ſufficient numbers, and alſo ſo nearly at the ſame inſtant, as to produce an echo, though the diſtance of the reflecting ſurface from the ear be leſs than the limit of echoes. This is confirmed by a ſingular echo in a grotto on the banks of a little brook called the Dinan, about two miles from Caſtlecomber, in the nounty of Kilkenny, Ireland. As you enter the cave, and continue ſpeaking loud, no return of the voice is perceived ; but on your arriving at a certain point, which is not above 14 or 15 feet from the reflecting ſurface, a very diſtinct echo is heard. Now this echo cannot ariſe from the firſt courſe of pulſes that are reflected to the ear, becauſe the breadth of the cave is ſo ſmall, that they would too quickly produce a diſtinct ſenſation from that of the original ſound: it therefore is produced by thoſe pulſes, which, after having been reflected ſeveral times from one ſide of the grotto to the other, and having run over a greater ſpace than 127 feet, arrive at the ear in conſiderable numbers, and not more diſtant from each other, in point of time, than the ninth part of a ſecond.

SECT. IV. *Entertaining* EXPERIMENTS *with* SOUND.

I. PLACE a concave mirror of about two feet diameter, Plate III. fig. 6, in a perpendicular direction. The focus of this mirror may be 15 or 18 inches from its ſurface. At the diſtance of about five or ſix feet, let there be a partition, in which there is an opening EF equal to the ſize of the mirror; againſt this opening muſt be placed a picture, painted in water colours, on a thin cloth, that the ſound may eaſily paſs through it. Behind the partition, at the diſtance of two or three feet, place another mirror, GH, of the ſame ſize as the former, and let it be diametrically oppoſite to it. Place the figure of a man C, ſeated on a pedeſtal, with his ear exactly in the focus of the firſt mirror: his lower jaw muſt be made to open by a wire, and ſhut by a ſpring; and there may be another wire to move the eyes: theſe wires muſt paſs through the figure, go under the floor, and come up behind the partition. A perſon, properly inſtructed, ſhould be placed behind the partition near the mirror. Then propoſe to any one to ſpeak ſoftly to the ſtatue, by putting his mouth to the ear of it, aſſuring him that it will anſwer inſtantly. You then give the ſignal to the perſon behind the partition, who, by placing his ear to the focus I, of the mirror, GH, will hear diſtinctly what the other ſaid; and, moving the jaw and eyes of the ſtatue by the wires, will return an anſwer directly, which will in like manner be diſtinctly heard by the firſt ſpeaker. This experiment appears to be taken from the Century of Inventions of the Marquis of Worceſter: whoſe deſigns, at the time they were publiſhed, were treated with ridicule and neglect as being impracticable, but are now known to be generally, if not univerſally, practicable. The words of the Marquis are theſe: "How to make a brazen or ſtone head in the midſt of a great field or garden, ſo artificial and natural, that though a man ſpeak ever ſo ſoftly, and even whiſper into the ear thereof, it will preſently open its mouth, and reſolve the queſtion in French, Latin, Welſh, Iriſh, or Engliſh, in good terms, uttering it out of its mouth, and then ſhut it until the next queſtion be aſked."—The two following, of a ſimilar nature, appear to have been inventions of Kircher, by means of which, he uſed to "utter feigned and ludicrous conſultations, with a view to ſhow the fallacy and impoſture of ancient oracles."

II. LET there be two heads of plaſter of Paris, placed on pedeſtals, on the oppoſite ſides of a room. There muſt be a tin tube of an inch diameter, that muſt paſs from the ear of one head, through the pedeſtal, under the floor, and go up to the mouth of the other. Obſerve, that the end of the tube, which is next the ear of the one head, be conſiderably larger than that end, which comes to the mouth of the other. Let the whole be ſo diſpoſed that there may not be the leaſt ſuſpicion of a communication. When a perſon ſpeaks, quite low, into the ear of one buſt, the ſound is reverberated thro' the length of the tube, and will be diſtinctly heard by any one who ſhall place his ear to the mouth of the other. It is not neceſſary that the tube ſhould come to the lips of buſt.—If there be two tubes, one going to the ear, and the other to the mouth, of each head, two perſons may converſe together, by applying their mouth and ear reciprocally to the mouth and ear of the buſts; and at the ſame time other perſons that ſtand in the middle of the chamber, between the heads, will not hear any part of their converſation.

III. PLACE a buſt on a pedeſtal in the corner of a room, and let there be two tubes, as in the foregoing amuſement: one of which muſt go from the mouth, and the other from the ear of the buſt, through the pedeſtal, and the floor, to an under apartment. There may be likewiſe wires that go from the under jaw and the eyes of the buſt, by which they may be eaſily moved. A perſon being placed in the under room, and, at a ſignal given, applying his ear to one of the tubes, will hear any queſtion that is aſked, and immediately reply; moving at the ſame time, by means of the wires, the mouth and eyes of the buſt, as if the reply came from it.

IV. IN a large caſe, ſuch as are uſed for dials and ſpring-clocks, the front of which, or at leaſt the lower part of it, muſt be of glaſs, covered on the inſide with gauze, let there be placed a barrel organ, which, when wound up, is prevented from playing, by a catch that takes a toothed wheel at the end of the barrel. To one end of this catch there muſt be joined a wire, at the end of which there is a flat circle of cork, of the ſame dimenſion with the inſide of a glaſs tube, in which it is to riſe and fall. This tube muſt communicate with a reſervoir that goes acroſs the front part at the bottom of the caſe, which is to be filled with ſpirits, ſuch as is uſed in thermometers, but not coloured, that it may be the better concealed by the gauze. This caſe being placed in the ſun, the ſpirits will be rarefied by the heat; and riſing in the tube, will lift up the catch or trigger, and ſet the organ in play: which it will continue to do as long as it is kept in the ſun; for the ſpirits cannot run out of the tube, that part of the catch, to which the circle is fixed, being prevented from riſing beyond a certain point, by a check placed over it. When the machine is placed againſt the ſide of a room on which the ſun ſhines ſtrong, it may conſtantly remain in the ſame place, if incloſed in a ſecond caſe, made of thick wood, and placed at a little diſtance from the other. When you want it to perform, it will only be neceſſary to throw open the door of the outer caſe, and expoſe it to the ſun. But if the machine be moveable, it will perform in all ſeaſons by being placed before the fire; and in winter it will more readily ſtop when removed into the cold.

V. AT the top of a ſummer-houſe, or other building, let there be fixed a vane AB, on which is the pinion C, that takes the toothed wheel D, fixed on the axis EF, which at its other end carries the wheel G, that takes the pinion H. All theſe wheels and pinions are to be between the roof and the cieling of the building. The pinion H is fixed on the perpendicular axis K, which goes down very near the wall of the room, and may be covered after the ſame manner as are bell-wires. At the lower end of the axis K there is a ſmall pinion L, that takes the wheel M, fixed on the axis of the great wheel NO. In this wheel there muſt be placed a number of ſtops, correſponding to the tunes it is to play. Theſe ſtops are to be moveable, that the tunes may be altered at pleaſure. Againſt this wheel there muſt hang twelve ſmall bells, anſwering to the notes of the gamut. Therefore, as the wheel turns round, the ſtops ſtriking againſt the bells, play the ſeveral tunes. There ſhould be a fly to the great wheel, to regulate its motion when the wind is ſtrong. The wheel NO, and the bells, are to be incloſed in a caſe.

There may be ſeveral ſets of bells, one of which may anſwer to the tenor, another to the treble, and a third to the baſs; or they may play different tunes, according to the ſize of the wheel. As the bells are ſmall, if they are of ſilver, their tone will be the more pleaſing.

Inſtead of bells, glaſſes may be here uſed, ſo diſpoſed as to move freely at the ſtroke of the ſtops. This machinery may likewiſe be applied to a barrel-organ; and to many other uſes.

ACQS, a town at the foot of the Pyrenees, in the department of Arriege, and late province of Foix, in France. It is famous for hot ſprings in its neighbourhood, from which it takes its name. Long. 76. 40. E. Lat. 43. 0. N.

Acqs, Aqua or Dax, a city on the river Adour, in the diſtrict of Auribat, belonging to the government of Guyenne and Gaſcony, in France. The fortifications of the town are inconſiderable, and its caſtle of little importance. There are warm baths both in the city and its environs. Long. 76. 10. E. Lat. 43. 47. N.

ACQUA, a town in Tuſcany, famous for warm baths. Long. 87. 10. E. Lat. 43. 45. N.

Acqua-che-favella, a celebrated fountain of Italy, in Calabria Citerior, a province of Naples. It lies near the mouth of the river Crata, and the ruins, called Sibari Boninati.

ACQUACKNAK, or Aquacknunk, a town in Eſſex county, ſtate of New-Jerſey, ſituated on the weſt ſide of the Paſſaic, being about 10 miles to the northward of Newark, and 17 to the north-weſtward of the city of New-York.

To ACQUAINT, *v. a.* to inform; to make known: to declare.

ACQUAINTANCE, *n. s.* familiarity, knowledge; a perſon of whom we have ſome knowledge, without the intimacy of friendſhip.

ACQUAINTED, familiar, well known; not new.

ACQUAPENDENTE, a pretty large town of Italy, in the patrimony of St. Peter, with a biſhop's ſee, ſeated on a mountain, near the river Paglia, 30 miles N. by W. from Rome, and 10 m. W. from Orvieto. Long. 87. 17. E. Lat. 42. 43. N.

ACQUEST, *n. s.* the thing gained; acquiſition; a plate acquired by the ſword.

Acquest, in law, goods acquired by purchaſe or donation, not by heritage.

ACQUI, a town of Italy, in the duchy of Montſerrat, with a biſhop's ſee, and commodious baths. It was taken by the Spaniards in 1745, and retaken by the Piedmonteſe in 1746; but after this, it was taken again and diſmantled by the French, who afterwards forſook it. It is ſeated on the river Borneo, 25 miles N. W. of Genoa, and 30 .S of Caſal. Long. 83. 35. E. Lat. 44. 40. N.

To ACQUIESCE, *v. n.* to reſt in, or remain ſatisfied with.

ACQUIESCENCE, *n. s.* a ſilent appearance of content, diſtinguiſhed on one ſide from avowed conſent, on the other from oppoſition; ſatisfaction, ſubmiſſion, confidence.

Acquiescence, in law, the conſent of a perſon to the determination of another in his cauſe, which concludes it.

ACQUIETANDIS, plegiis, *n. s.* a writ of juſtice lying for a ſurety againſt the creditor that refuſes to acquit a debtor after the debt is paid.

ACQUIRABLE, *adj.* that which may be acquired or obtained; attainable.

To ACQUIRE, *v. a.* 1. To gain by one's own labour or power; to obtain what is not received from nature, or tranſmitted by inheritance. 2. To come to; to attain.

ACQUIRED, *part.* gained by one's ſelf, in oppoſition to thoſe things which are beſtowed by nature.

ACQUIREMENT, *n. s.* that which is acquired; gain attainment.

ACQUIRER, *n. s.* one who acquires; a gainer.

ACQUISITION, *n. s.* the act of acquiring or gaining; the thing gained.

Acquisition, in law, the right or title to an eſtate obtained by purchaſe or donation.

ACQUISITIVE, *adj.* that which is acquired or gained.

To ACQUIT, *v. a.* to ſet free; to diſcharge; to clear from an accuſation of guilt.

ACQUITMENT, *n. s.* the ſtate of being acquitted; or act of acquitting.

ACQUITTAL, *n. s.* in law, is a deliverance and ſetting free from the ſuſpicion or guiltineſs of an offence.

Acquittal is of two kinds: in *law*, and in *fact*. When two are indicted of felony, the one as a principal, the other as acceſſory; the principal being diſcharged, the acceſſory is by conſequence, alſo freed: In which caſe, as the acceſſory is acquitted by law, ſo is the principal in fact. Acquittal is alſo uſed, where their is a lord meſn and a tenant, and the tenant holds lands of the meſn, and the meſn holds overthe lord paramour: here, the meſn ought to acquit the tenant of all ſervices claimed by any other for the ſame lands: the tenant being to do ſervice to the meſn only, and not to divers lords for one parcel of land.

ACQUITTANCE, *n. s.* a writing teſtifying the receipt of a debt.

Acquittance, in law, a releaſe or diſcharge in writing for a ſum of money, witneſſing that the party has paid the ſaid ſum. No man is obliged to pay a ſum of money if the defendant refuſes to give an acquitance, which is a full diſcharge, and bars all actions, &c. An acquittance given by a ſervant for a ſum of money received for the uſe of his maſter, ſhall be a good diſcharge for that ſum, provided the ſervant uſed to receive his maſter's rents, debts, &c.

ACRA, *n. s.* a land meaſure among the ancients, containing 10 feet, from which Salmaſius ſuppoſes the word acre is derived.

Acra, a town of Africa, on the coaſt of Guinea, where the Engliſh, Dutch and Danes, have ſtrong forts, and each fort its particular village. Long. 74. 58. E. Lat. 5. 0. N.

Acra, in ancient geography, one of the hills of Jeruſalem, on which ſtood the lower town or Old Jeruſalem: to which was afterwards added Zion. It was probably called Acra, from the fortreſs which Antiochus built there in order to annoy the temple, and which Simon Maccabeus took and razed to the ground.

Acra Japygia, in ancient geography, called *Salentia* by Ptolemy; now *Capo di San Maria di Leuca*: A promontory in the kingdom of Naples, to the ſouth-eaſt of Otranto, where formerly there was a town, now lying in ruins, on the Ionian ſea, over againſt the Montes Acroceraunii of Epirus.

Acra, in Syria. See Acre.

Acræ, in ancient geography, a town of Sicily, which ſtood 24 m. S. from Syracuſe near the place now called the monaſtery of *Santa Maria d'Arcia*, on an eminence. The Syracuſans were the founders of it, according to Thucidydes, 70 years after the building of Syracuſe, 755 before Chriſt.

ACRAGAS, or Agragas, in ancient geography, ſo called by the Greeks, and ſometimes by the Romans, but more generally *Agrigentum*, by the latter; a town of Sicily, which ſtood upon a mountain, at the confluence of the Acragas and Hypſa, near the port called Emporion, by Ptolemy. The people of Gela built Acragas, 108 years after building their own city, and A. A. C. 584. It took its name from the river, and, being but two miles from the ſea, enjoyed all the conveniences of a ſea-port. It was a place of great ſtrength, ſtanding on the top of a very ſteep rock, and waſhed on the S. ſide by the river Acragas, now called *Fimue di Gergenti*, and on the S. W. by the Hypſa, with a citadel to the S. E. externally ſurrounded by a deep gulph, which made it inacceſſible but on the ſide next the town. It was famous for the tyrant Phalaris and his brazen bull. The country around it was laid out in vine and olive yards, in the produce of which they carried on a great and profitable commerce with Carthage. Long. 88. 30. E. Lat. 37. 20. N. See Agrigentini.

ACRAI, an Arabic word, ſignifying either satyriasis, or furor uterinus, which ſee.

ACRAPULA, *n. s.* a medicine to prevent the bad effects of eating and drinking to exceſs.

ACRAS, or rather Achras, the wild pear. See Sapota.

ACRASIA, in medicine, implies the predominancy of one quality above another, either with regard to artificial mixtures, or the humours of the human body, when not mixed in a juſt proportion.

ACRASY, ſee laſt article. Hippocrates uſes the word *Akrasia*, to expreſs exceſs of any kind, either by intemperance or imbecility.

ACRATH, in ancient geography, a place in Mauritania Tingitana, now ſuppoſed to be *Velez de Gomara*: a fortified town in the kingdom of Fez, with a citadel and commodious harbour on the Mediterranean, ſcarce a mile diſtant from Penon de Velez, a Spaniſh fort. Long. 70. E. Lat. 34. 45. N.

ACKATISMA, *n. s.* in antiquity, a breakfaſt among the ancient Greeks, conſiſting of a morſel of bread ſoaked in pure unmixed wine.

ACRATOMELI. See Mulsum.

ACRATOS, ſimple, unmixed. This is very often uſed by Hippocrates, and applied to excretions of different ſorts, and is always of very bad preſage. Thus, in his *Prænotiones*, he obſerves, that in all painful diſorders of the pleura and lungs, the ſpittle ſhould appear mixed and yellow; and that it is a dangerous ſymptom if it be all yellow, without any mixture; but that if it appear black, it is a very bad preſage.

ACRE, or Acra, a ſea-port town in Syria. It was formerly called *Ptolemais*, and is a biſhop's ſee. It is ſituated at the north angle of a bay, which extends in a ſemicircle of 3 leagues, as far as the point of Carmel. During the cruſades, the poſſeſſion of this town was long diſputed by the Chriſtians and Saracens. In 1192, it was taken from the latter, by Richard I. of England and Philip of France, who gave it to the Knights of St. John of Jeruſalem, who kept poſſeſſion of it 100 years, when it was retaken by the Saracens, and almoſt entirely deſtroyed. This event is rendered memorable by an act of ſingular reſolution with which it was accompanied. A number of beautiful young nuns, terrified at the proſpect of being expoſed to the brutal luſt of the infidels, reſolved to avoid the violation of their chaſtity, by rendering themſelves objects of averſion. With this view they cut off their noſes and mangled their faces. The Saracens, inflamed with reſentment at a ſpectacle which prevented the gratification of their appetites, immediately put them all to the ſword. After the expulſion of the cruſaders it remained almoſt deſerted; but in our time, has again revived by the induſtry of Daher; and the works erected by Djezzar, within the laſt 20 years, have rendered it one of the principal towns upon the coaſt. The Moſque of this Pacha is boaſted of as a maſter-piece of eaſtern taſte. The bazar, or covered market, is not inferior even to thoſe of Aleppo; and its public fountain ſurpaſſes in elegance thoſe of Damaſcus, though the water is very indifferent. The Pacha has derived the more honour from theſe works, as he was himſelf both the engineer and architect: he formed the plans, drew the deſigns, and ſuperintended the execution. The port of Acre is one of the beſt ſituated on the coaſt, as it is ſheltered from the N. and N. W. winds by the town itſelf; but is greatly choaked up ſince the time of Fakr-eldin. Djezzar has contented himſelf with making a landing place for boats. Corn and cotton form the baſis of the commerce of Acre, which is becoming more flouriſhing every day. Of late, the Pacha, by an abuſe common throughout all the Turkiſh empire, has monopolized all the trade in his own hands; no cotton can be ſold but to him, and from him every purchaſe muſt be made. In vain have the European merchants claimed the privileges granted them by the Sultan:—Djezzar replied, that he was the Sultan in his own country, and continued his monopoly. Theſe merchants in general are French, and have ſix houſes at Acre, with a conſul: an imperial agent too is lately ſettled there; alſo a reſident for Ruſſia. That part of the bay of Acre, in which ſhips anchor with the greateſt ſecurity, lies to the north of Mount Carmel, below the village of Haiſa, commonly called Caiffa. The bottom is good holding ground, and does not chafe the cables; but the harbour is open to the N. W. wind which blows violently all along this coaſt. Mount Carmel, which commands it to the ſouth, is a flattened cone, and very rocky; it is about 2,000 feet high. We ſtill find among the brambles wild vines and olive trees, which prove that induſtry has been formerly employed even in this ungrateful ſoil. On the ſummit is a chapel dedicated to the prophet Elias, which affords an extenſive proſpect over the ſea and land.

The fortifications of this place, though kept in better order than thoſe any where elſe in Syria, are by no means equal to what is generally found in European garriſons. Early, however, in the year 1799, when the Pacha was informed, that Bonaparte after having ſubdued the whole of Egypt, was marching through Syria, at the head of his victorious legions, and bending his courſe towards Acre; every exertion was made to put the fortreſs in the beſt poſture of defence. Djezzar, however, was at firſt ſo greatly intimidated, at the approach of the French army, that he ſeemed to have given up the idea of defending himſelf at St. Jean d'Acre, and was only anxious to ſecure his retreat, and to convey to a place of ſafety, his women and treaſure. But commodore Sir Sidney Smith, who, at that very time, arrived in the road with the Britiſh ſhips the Tiger, the Theſeus, and the Alliance, under his command, greatly raiſed the drooping ſpirits of the Pacha, and increaſed his means of reſiſtance, by ſending him an ancient French engineer of great merit, to whoſe friendſhip he himſelf had been formerly indebted for his deliverance from the tower of the Temple, and for his return to England. This officer (col. Philippeaux) cauſed the fortreſs to be repaired, which was fortified after the mode of the 12th century, with courtines flanked with ſquare towers; and the Engliſh veſſels had furniſhed him with whatever means he could diſpoſe of to repair this ancient bulwark of Syria. Nevertheleſs, theſe labours would moſt likely have been inſufficient to ſuſtain Djezzar againſt the attacks of the French, if, at the very moment when Bonaparte had finiſhed the inveſtment of Acre, the fleet of gun boats, which had on board the greateſt part of his battering pieces and his ſtores, had not fallen into the hands of the Engliſh. This loſs, irreparable to the French, in the ſituation they were in, decided the fate of St. Jean d'Acre; for, notwithſtanding the ſtate of defence in which colonel Philippeaux had put it, the boldneſs and intrepidity of the French in their attack might have made up for the want of the heavy artillery, and all the machinery neceſſary to preſs on a ſiege; but it is evident, that theſe objects ſo neceſſary to the French, not only loſt and deſtroyed, but taken and tranſported for the defence of this ſame place, ought, if they were well employed, to make the balance of means turn in favor of the beſieged. The cannon and ſtores were landed inſtantly, and the veſſels which had tranſported them, employed to harraſs the French. Bonaparte, however, was too much bent upon the capture of this fortreſs to be diverted from his purpoſe, by this immenſe loſs. After having, therefore, taken poſſeſſion of Saffet, Nazareth and Scheffam, he opened his trenches on the 20th of March, at 900 feet from the town. The French puſhed their works at firſt with ſo much activity, that the ninth day after the opening of the trench, batteries and counter-batteries, with four pieces of twelve pounders, eight pieces of eight and four mortars, had pierced the tower, while a branch of the mine had been puſhed on to blow up the counterſcarp. The mine was ſprung, but it only made a hole in the glacis. The ditch, which had been badly reconnoitred, had appeared but of little depth: the ardour of the grenadiers, and the contempt with which the taking of the other places of Syria, had inſpired them for this kind of fortification, did not ſuffer them to heſitate. Inſtead, however, of finding every obſtacle ſmoothed and levelled, they were ſtopped by a ditch of fifteen feet, of which ſcarcely half was filled up by the rubbiſh of the breach; they plunged into it, placed ladders, climbed the breach, but found themſelves ſeparated by the counterſcarp from the troops, which were to ſupport them. Moſt of the officers, who headed the attack, periſhed under a moſt dreadful fire, when the Turks, who had abandoned the tower, re-entered it, and the French retreated to their trenches.

The ill ſucceſs of this firſt attack, and the hopes which Djezzar entertained of being ſupported by a body of natives, who were to aſſemble at Damaſcus, led him to make ſeveral briſk ſallies, in which he was repulſed with conſiderable loſs. Bonaparte had not yet received the heavy artillery for which he had ſent to Damietta, to replace that which he had loſt; a few pieces only, and a part of the ſtores had been landed at Jaffa, but had not yet reached him. He endeavoured a ſecond time to open a breach in the ſame tower, which the Turks had filled with wood, bales of cotton, and bags of earth; the tower was ſet on fire, but all attempts to reach it were vain.

It would be too tedious, in a work of this kind to enumerate the various ſallies which were made by the beſiegers, and the numerous attacks of the beſieged, in all of which the utmoſt fortitude and determination was diſplayed on both ſides, and vaſt multitudes periſhed; the proximity of the combatants, and the nature of the warfare, in a great meaſure, compelling both parties to mutual extermination. We ſhall, therefore, only add, that the French, after having performed prodigies of valour, found it uſeleſs to make any farther attempts upon a garriſon, which was not only far ſuperior to them in point of numbers, ammunition, and every ſpecies of military ſtores, but alſo continually proviſioned on the ſide of the ſea, and protected by Sir Sidney Smith's ſquadron. Bonaparte having, therefore, finally determined to raiſe the ſiege, firſt ordered his ſick and wounded to be ſent off, many of whom fell into the hands of the Engliſh, and that he might keep the beſieged in check, he redoubled the fire of his cannon and mortars. Djezzar having marked thoſe firſt diſpoſitions for retreat, made frequent ſallies, which were repulſed with vigour. The aſpect of the field of carnage was horrible; the ditches and the reverſes of the parapets were filled with corpſes, the air was infected, and the propoſition for a ſuſpenſion of arms to bury the dead remained unanſwered. The raiſing of the ſiege was executed in good order; the fire againſt the place kept up to the laſt moment, and the very day on which the army began its march, (the 20th of May) being the 61ſt after breaking ground, general Le Grange, who commanded, repulſed two ſallies, and drove the Turks back into the town. On the 26th day after this, Bonaparte, with the main army, reached Cairo, in Egypt. And thus ended a ſiege, which will ever be memorable in the annals of hiſtory; not only for the great prodigies of valour by which it was diſtinguiſhed, and the immenſe carnage it occaſioned, but alſo, becauſe it gave a check to the unprecedented career of the French general, whom fortune had uniformly crowned with ſucceſs on every previous occaſion. It is 28 miles S. of Tyre, and 37 N. of Jeruſalem. Long. 110. 25. E. Lat. 32. 32. N.

Acre, in the Mogul's dominions, the ſame with lack, ſignifies the ſum of 100,000 rupees; the rupee is of the value of the French crown of three livres, or 30 ſols of Holland; 100 lacks of rupees make a couron in Indoſton, or

10,000,000 rupees: eight rupees are equal to a pound ſterling, or four dollars and 44 cents, according to which proportion, a lack of rupees amounts to 55,500 dollars.

Acre, the univerſal meaſure of land in Britain. The word (formed from the Saxon *acher*, or the German, *acker*, a field, or perhaps the Latin *ager*, ground,) did not originally ſignify a determined quantity of land, but any open ground, eſpecially a wide campaign; and in this antique ſenſe it ſeems to be preſerved in the names of places, as Caſtle-acre, Weſt-acre, &c. An acre in England contains 4 ſquare roods, a rood 40 perches or poles, of 16 feet and an half each by ſtatute. Yet this meaſure does not prevail in all parts of England, as the length of the pole varies in different counties, and is called cuſtomary meaſure, the difference running from the 16 and a half to 28. The acre is alſo divided into 10 ſquare chains of 22 yards each, that is, 4840 ſquare yards. An acre in Scotland contains 4 ſquare roods: 1 ſquare rood is 40 ſquare falls; 1 ſquare fall, 36 ſquare ells; 1 ſquare ell, 9 ſquare feet and 73 ſquare inches; 1 ſquare foot, 144 ſquare inces. The Scots acre is alſo divided into 10 ſquare chains; the meaſuring chain ſhould be 24 ells in length, divided into 100 links, each link $8\frac{279}{1000}$ inches; and ſo one ſquare chain will contain 10,000 ſquare links. The Engliſh ſtatute acre is about three roods and 6 falls, ſtandard meaſure of Scotland.—The French acre *(arpent)* contains one Engliſh acre and a fourth, or 54,450 ſquare Engliſh feet, whereof the Engliſh acre contains only 43,560.—The Straſburg acre is about half an Engliſh acre.—The Welſh acre contains commonly two Engliſh ones.—The Iriſh acre is equal to 1 acre, 2 roods, and 19 perches $\frac{27}{121}$, Engliſh. Dr. Grew attempts to aſcertain the number of acres in England, which, according to him, amounts to 46,080,000. The Batavian republic, before the late revolution, was ſaid to contain 4,381,000 acres: the province of Hollend but 1,000,000 of acres. The territory of the United States of America, according to calculations lately made by order of Congreſs, contains 519,000,000 of acres, excluſive of water, which is computed at 51,000,000 more. Mr. Tench Coxe in his invaluable work on the United States, publiſhed in 1794, computes the extreme length of the States at 1250 miles; the ſuperficial content in acres at 640,000,000, including land and water; after deducting the ſpace occupied by various lakes and mighty rivers, which occupy about one ſeventh of the whole, there remain about 590,000,000 of arcres of firm land.

ACREME, a term ſometimes uſed in ancient law-books, for 10 acres.

ACRIBEIA, a term literally denoting an exquiſite or delicate accuracy; it is ſometimes uſed in our language for want of a word of equal ſignification.

ACRID, *adj.* of a hot biting taſte; bitter; ſo as to leave a painful heat upon the organs of taſte.

Acrid, in natural hiſtory, denotes any thing ſharp or pungent to the taſte. Ancient naturaliſts diſtinguiſh two kinds of acrid taſte; the firſt proceeding from hot and dry, as that of pepper; the ſecond from hot and moiſt, as that of garlick. Acrid, according to Grew, properly belongs to the claſs of compound taſtes. It is not ſimply ſour or pungent, there being bodies not acrid, which yet are pungent, e. g. alum; nor is it ſimply hot; for there are many hot bodies which are not acrid, as the roots of zedoary, yarrow, and contrayerva. The characteriſtic, therefore, of acritude conſiſts in pungency joined with heat. Acrid bodies, by the pungency and tenuity of their parts, incite, digeſt, heat, open, irritate, purge, cauſe appetite, &c. They inflame the ſkin, when chewed produce ſaliva, and when ſnuffed, ſneezing. Acrid things are hurtful to the head and eyes, and contrary to bilious temperaments; but advantageous to pituitous ones. Acrids may be divided into claſſes, according as they yield their acrimony. 1. By diſtilation. 2. By infuſion. 3. By neither. In leucophlegmatic habits they are powerful expectorants, deobſtinents, diuretics, and emmenagogues. Their virtue frequently depends on the trouble they give to the ſtomach.

ACRIDOPHAGI, in ancient geography, an Ethiopean people, repreſented as inhabiting near the deſarts, and to have fed on locuſts. Diodorus, Siculus and Strabo give the following account of them. Their ſtature was lower than that of other men; they were meagre, and extremely black. In the ſpring, high weſt winds drove, from the deſerts, to their quarter locuſts of an extraordinary ſize. and remarkable for the ſqualid colour of their wings. So great was the number of theſe inſects, that they were the only ſuſtenance of the barbarians, who took them in the following manner: At the diſtance of ſome ſtadia from their habitations there was a wide and deep valley. They filled this valley with wood and wild herbs, with which their country abounded. When the cloud of locuſts appeared, which were driven on by the wind, they ſet fire to the fuel which they had collected. The ſmoke which aroſe from this immenſe fire was ſo thick, that the locuſts, in croſſing the valley, were ſtifled by it, and fell in heaps on the ground. The paſſage of the locuſts being thus intercepted for many days, they made a large proviſion of theſe inſects. As their country produced great quantities of ſalt, they ſalted them. to render them more palatable, and to make them keep till the next ſeaſon. This peculiar ſupply was their ſole food: they had neither herds nor flocks. They were unacquainted with fiſhing; for they lived at a diſtance from the ſea. They were very active, and ran with great ſwiftneſs. But their life was not of long duration; it exceeded not 40 years. The cloſe of their life was extremely miſerable; for in their old age, lice of different forms are ſaid to have bred in their bodies, and to have increaſed ſo rapidly as to render it impoſſible to exterminate them. The unhappy ſufferer was ſeized with the moſt excruciating torments, and ſoon fell a victim to this deplorable calamity. Whether this extraordinary and dreadful diſtemper was occaſioned by the food of the inhabitants of this country, or by a peſtilential quality of the climate, it is difficult to determine. Indeed as to the credibility of the whole account, we muſt leave the reader to judge. But though theſe circumſtances ſhould be deemed fabulous, yet the eating of theſe inſects may be true. It is well known, that to this day the inhabitants of Ethiopia, Arabia, &c. frequently uſe locuſts as food. Dr. Haſſelquiſt, who travelled in Syria and Egypt ſo late as the year 1752, with a view to improve natural hiſtory, informs us, that he aſked Franks, and many other people who had lived long in theſe countries, whether they had ever heard that the inhabitants of Arabia, Ethiopia, &c. uſed locuſts as food. They anſwered that they had. He likewiſe aſked the ſame queſtion of Armenians, Cophtes, and Syrians, who lived in Arabia, and had travelled in Syria and near the Red Sea; ſome of whom ſaid they heard of ſuch a practiſe, and others that they had often ſeen the people eat theſe inſects. He at laſt obtained complete ſatisfaction on this head from a learned ſheick at Cairo, who had lived ſix years at Mecca. This gentleman told him, in preſence of M. le Grand, the principal French interpreter at Cairo, and others, that a famine frequently rages at Mecca, when there is a ſcarcity of corn in Egypt, which obliges the inhabitants to live upon coarſer food than ordinary; that when corn is ſcarce, the Arabians grind the locuſts in hand mills, or ſtone mortars, and bake them into cakes, and uſe theſe cakes in place of bread: that he has frequently ſeen locuſts uſed by the Arabians, even when there was no ſcarcity of corn; when they boil them, ſtew them with butter, and make them into a kind of fricaſee; which he ſays is not ſo diſagreeably taſted, and he had ſometimes taſted theſe locuſt fricaſees out of curioſity. A later traveller, Dr. Sparrman, informs us, "That locuſts ſometimes afford a high treat to the more unpoliſhed and remote hordes of the Hottentots; when, as ſometimes happens, after an interval of 8, 10, 15, or 20 years, they make their appearance in incredible numbers. At theſe times they come from the north, migrating to the ſouthward, and do not ſuffer themſelves to be impeded by any obſtacles, but fly boldly on, and are drowned in the ſea whenever they come to it. The females of this race of inſects, which are moſt apt to migrate, and are chiefly eaten, are ſaid not to be able to fly: partly by reaſon of the ſhortneſs of their wings; and partly on account of their being heavy and diſtended with eggs: and ſhortly after they have laid theſe in the ſand they are ſaid to die. It is particularly of theſe that the Hottentots make a brown coffee coloured ſoup, which, at the ſame time, acquires from the eggs a fat and greaſy appearance. The Hottentots are highly rejoiced at the arrival of theſe locuſts, though they are ſure to devour every bit of verdure on the ground: but the Hottentots make themſelves ample amends for this loſs, by falling foul on the animals themſelves, eating them in ſuch quantities, as in the ſpace of a few days to get viſibly fatter than before." The Abbe Poiret, alſo, in his Memoir on the Inſects of Barbary and Numidia, informs us, "That the Moors make locuſts a part of their food; that they go to hunt them; fry them in oil and butter; and ſell them publicly at Tunis, at Bonne, &c. From theſe accounts we ſee the folly of that diſpute among divines about the nature of John the Baptiſt's food in the wilderneſs; ſome maintaining the original word to ſignify the fruits of certain trees: others, a kind of birds, &c. but thoſe who adhered to the literal meaning of the text, were not only the moſt orthodox, but their opinions were the moſt probable, and their arguments would have been ſtronger, had they had an opportunity of quoting ſuch authors as the above.

ACRIFOLIUM, any prickly-leafed plant.

ACRIMONIOUS, *adj.* abounding with acrimony; ſharp; corroſive.

ACRIMONY, *n. s.* 1. Sharpneſs, corroſiveneſs.—2. Bitterneſs of thought or language.

ACRIS, in natural hiſtory, a locuſt.

Acris, in ſurgery, the extremity of a fractured bone.

ACRISY, in medicine, a ſtate of diſeaſe, of which no right judgment can be formed whether the patient will recover or not.

ACRITAS, in ancient geography, a promontory of Meſſenia, running into the ſea, and forming the beginning of the bay of Meſſene; now called *Capo di Gallo*, between Methone to the W. and Corone to the E. where the Sinus Coronæus begins.

ACRITUDE, *n. s.* an acrid taſte; a biting heat on the palate.

ACRITY, *n. s.* ſharpneſs in taſte; tartneſs.

ACRIVIOLA, in botany, the Naſturtium Indicum, o Indian creſs.

ACROAMATIC, applied to philoſophy, theology, &c. any thing ſublime, profound, or abſtruſe; alſo what is kept ſecret, or remote from popular uſe. In this ſenſe, Reimman ſtiles thoſe MSS. of the library of Vienna, abridged from the vaſt commentaries of Lambecius and Neſſelius, *bibliotheca acroamatica*.

ACROATHOUM, or Acrothoum, in ancient geography, a town ſituated on the top of mount Athos, where the inhabitants, according to Mela, were longer lived by half than any other country; called by the modern Greeks *Agion oros*; by the Italians, *La Cima di Monte Santo*.

ACROATICKS, *n. s.* Ariſtotle's lectures to his diſciples were of two kinds; *exoteric* and *acroatic*. The acroatic were thoſe to which only his own diſciples and intimate friends were admitted; whereas the exoteric were public, and open to all. The acroatic were ſet apart for the higher and more abſtruſe ſubjects; the exoteric were employed in rhetorical and civil ſpeculations. The acroatics were more ſubtile and exact, evidence and demonſtration being aimed at; the exoterics chiefly aimed at the probable and plauſible. The former were the ſuject of the morning's exerciſes in the Lyceum, the latter of the evining's. The exoterics were publiſhed: the acroatics were kept ſecret; being either entirely concealed; or, if they were publiſhed, it was in ſuch obſcure terms, that few but his own diſciples could be the wiſer for them. Hence, when Alexander complained of his preceptor for publiſhing his acroatics, and thus revealing what ſhould have been reſerved to his diſciples, Ariſtotle anſwered, that they were made public and not public; for that none, who had not heard them explained by the author *viva voce*, would underſtand them.

ACROCERAUNIA, or Montes Ceraunii, in ancient geography, mountains running out into the ſea, ſo called from their being often thunderſtruck, ſeparating the Ionian Sea from the Adriatic; where Illyria ends and Epirus begins, now called *Monti della Chimera*.

ACROCHORDON, a painful ſpecies of warts, very prominent and pendulous, having a large head with a ſmall pedicle, or baſe. They are alſo called *penſiles verrucæ*, or hanging warts, and ſtand diſtinguiſhed by the *ſeſſiles verrucæ*, or *myrmecia*. Others deſcribe the *acrochordon*, as a harder, rougher ſort of wart, growing under the cutis, very callus and uſually of the ſame colour with the ſkin: ſmall at bottom, and bigger upwards, but rarely exceeding the ſize of a bean.

ACROCORINTHUS, in ancient geography, a high and ſteep hill, hanging over the city of Corinth, which was taken within the walls, for an acropolis or citadel. On its top ſtood a temple of Venus; and lower down iſſued the fountain Pyrene.

ACROCORION, in botany, a name uſed by ſome authors for the ſeveral ſpecies of the ſpring crocuſes.

ACRODRYA, all fruits, that have rinds or ſhells, ſuch as acorns, almonds, nuts, cheſnuts, &c.

ACROE, in botany, the name given by the natives of Guinea, to a kind of ſhrub, which they uſe in wine, as a reſtorative and analeptic. It is of the trifoliate kind, and has ſomewhat of the appearance of the corallodendrus, but is not prickly; the middle or end leaf ſtands on a pedicle of an inch long, the other two leaves have no pedicles at all.

ACROMION, or Acromium, in anatomy, the upper part of the ſcapula or ſhoulder blade. See Anatomy.

ACROMONOGRAMMATICUM, among poets, a kind of poem, or compoſition, wherein each ſubſequent verſe commences with the letter with which the verſe preceding terminates.

ACRON, Great, an inland republic in Africa, near the Fantynean country.

Acron, Little, a territory on the Gold Coaſt of Guinea, in Africa, bordering on the Fantynean country. The Dutch have a fort in it, called Fort Patience; and under it is a village, inhabited only by fiſhermen. The other inhabitants are addicted to huſbandry, and ſell their corn to other countries. There is plenty of game, which is very commodious for the Dutch factory. The people are very ignorant, and go naked like the reſt of the negroes.

Acron, in botany, among the ancients, the capitulum, top, or flower of a plant of the thiſtle kind.

ACRONIUS lacus; a ſmall lake formed by the Rhine, ſoon after its riſe out of the Alps, and, after paſſing the greater lake at Conſtance, called *Venetus*, and now the *Bodenzee*, or leſſer lake of Conſtance.

ACRONYCAL, or Acronychal, a term of aſtronomy, applied to the ſtars, of which the riſing or ſetting is called *acronycal*, when they either appear above, or ſink below the horizon, at the time of ſunſet. It is oppoſed to *coſmical*.

ACROPOSTHIA, a word derived from the Greek, denoting the extremity of the prepuce, which is cut off in circumciſion.

ACROS, in anatomy, the prominences, or knobs, and tops of bones.

Acros, in botany, the head of a plant.

Acros, in medicine, the height of a diſeaſe.

ACROSPELOS, the wild oat graſs, or bromus.

ACROSPIRE, a ſhoot or ſprout from the end of ſeeds before they are put in the ground.

Acrospire, in natural hiſtory, &c. The ſame with Plumule, which ſee.

ACROSPIRED, or Acreſpired, *part.* is a word uſed in reſpect of barley, which, in the operation of making malt, is apt, after coming or ſprouting at the lower or root end, to ſprout alſo at the upper or blade end. It is then ſaid to become *acroſpired*.

ACROSS, *adv.* athwart, laid over ſomething ſo as to croſs it.

An ACROSTIC, *n. s.* a poem in which the firſt letter of every line being taken, makes up the name of the perſon or thing on which the poem is written.

Acrostics likewiſe ſignified poems, where the name was made up by the initial letters of the middle words, or the laſt of the final ones. Others went backwards; beginning with the firſt letter of the laſt verſe, and proceeding upwards. The appellation has alſo been applied by ſome authors to two ancient epigrams in the Anthology, in honour of Bacchus and Apollo. Each conſiſts of 25 verſes; the firſt whereof is the argument of the whole, and the other 24, compoſed of four epithets, beginning each with the ſame letter, and thus following in the order of the 24 letters of the Greek alphabet; from *Aipba* to *Omega*, each comprehending four epithets, which makes 96 in all for each god.

Acrostics, among eccleſiaſtical writers, denote the ends of verſes of pſalms, which the people ſang by way of chorus, or reſponſe, to the *pracentor*, or leader of the pſalm. This was called ſinging acroſtics which was a ſpecies of pſalmody uſual in the ancient church, and amounts to the ſame with *bypopsalma*, *diapsalma*, *acrotelution*, and *epbymnion*.

ACROSTICUM, Rustyback, Wall-rue, or Forkfern, in botany, a genus of the cryptogamia filices. The fructifications are accumulated on the whole inferior ſurface of the frond, ſo that they every where cover it. There are about 29 or 30 ſpecies; of theſe the moſt remarkable are,

1. Acrosticum Ilvense, or hairy fern, which grows in clefts of rocks;

2. Acrosticum Septentrionale, or horned fern, which grows alſo in clefts of rocks, and on walls; and

3. Acrosticum Thelypteris, or marſh fern, which grows in turfy bogs.

ACROSTOLIUM, in ancient naval architecture, the extreme part of the ornament uſed on the prows of their ſhips, which was ſometimes in the ſhape of a buckler, helmet, animal, &c. but more frequently circular, or ſpiral. It was uſual to tear them from the prows of vanquiſhed veſſels, and fix them to the conqueror's, as a ſignal of victory.

ACROTELEUTIC, among eccleſiaſtical writers, the end of a verſe or pſalm; or ſomething added thereto, to be ſung by the people, as the *Gloria Patri*, &c.

ACROTERI, a town in the iſland Santorin, in the ſea of Candia Long. 101. 1. E. Lat. 36. 25. N.

ACROTHYMIA, or Acrothymion, a ſort of wart deſcribed by Celſus as hard, rough, with a narrow baſis and broad top; the top is of the colour of thyme; it eaſily ſplits and bleeds. It is alſo called *thymus*.

ACT, *n. s.* 1. Something done; a deed; an exploit, whether good or ill.—2. Agency.—3. Action; the performance of exploits.—4. The doing of ſome particular thing; a ſtep taken; a purpoſe executed.—5. A ſtate of reality; effort.—6. Incipient agency; tendency to an effort.—7. A part of a play, during which the action proceeds without interruption.—8. A decree of a court of juſtice, or edict of a legiſlature.—9. A record of judicial proceedings.

Act, in general, denotes the exertion of power, and differs from power as the effect from the cauſe: or it is an effective exerciſe or application of ſome power or faculty. In this ſenſe, act ſtands oppoſed to power, *potentia*, which is only the capacity of acting, not the exertion of that capacity.

Metaphyſicians make various diviſions of act; viz. into *infinite*, as the act of creating; and *finite*, as the act of moving. *Transient*, or thoſe exerciſed in other beings, as heating; & *immanent*, which remain in their own ſubject, as thinking.

Act is particularly underſtood of an operation of the human mind. Thus, to diſcern, examine, and judge, are acts of the underſtanding: to affirm and chuſe, are acts of the will. There are voluntary acts, and ſpontaneous ones, which ſeem produced without the privity or participation of the ſoul.

Act *of Congreſs* is a poſitive law, conſiſting of two parts, the words or the act, and its true ſenſe and meaning; which being joined, make the law. The words of the acts of Congreſs ſhould be taken in a lawful ſenſe. Caſes of the ſame nature are within the intention, though without the letter, of the acts; and ſome acts extend by equity to things not mentioned therein. See Congress.

Act, in a legal ſenſe, is an inſtrument, or other matter in writing; of uſe to declare or juſtify the truth of a thing. In which ſenſe, records, decrees, ſentences, reports, certificates, &c. are called acts, authentic acts, ſolemn acts, &c. Acts alſo denote the deliberations and reſolutions of an aſſembly, ſenate, counſel, or convention, taken down by clerks, notaries, or the like, and entered in a regiſter.

Act, in our univerſities, is a theſis maintained in public by a candiate for a degree, or to ſhew the capacity and proficiency of a ſtudent in the univerſity. The candiates for a degree of bachelor and maſter of arts to hold philoſophy acts, &c. In ſome univerſities of the United States, the time when the maſters or doctors complete their degrees, is alſo called the *act* which is held with great ſolemnity. At New-York, Princeton, &c. they call it the *commencement*.

Act, in dramatic poetry, ſignifies a certain diviſion, or part, of a play, deſigned to give ſome reſpite both to the actors and ſpectators. The Romans were the firſt, among claſſic nations, who divided their theatrical pieces into acts; for no ſuch diviſions appear in the works of precedig dramatic poets. Their pieces, indeed, conſiſted of ſeveral parts or diviſions, which they called *protaſis*, *epitaſis*, and *cataſtrophe*; but theſe diviſions were not marked by any real interruptions on the theatre. Nor does Ariſtotle mention any thing of acts in his Art of Poetry. But, in the time of Horace, all regular and finiſhed pieces were divided into 5 acts.

Neve minor, neu ſit quinto productior actu
Fabula, quæ poſci vult & ſpectata reponi.

By genius led, with art the ſcenes contrive,
Arranged in acts not more nor leſs than five.

The firſt act, according to ſome critics, beſides introducing upon the ſtage the principal characters of the play, ought to propoſe the argument or ſubject of the piece; the ſecond, to exhibit this to the audience by carrying the fable into execution; the third, to raiſe obſtacles and difficulties; the fourth, to remove theſe, or raiſe new ones in the attempt; and the fifth, to conclude the piece, by introducing ſome accident that may unravel the whole affair. This diviſion, however, is not eſſentially neceſſary, but may be varied according to the humour of the author, or the nature of the ſubject.

We find, however, from ſome recent reſearches into Aſiatic learning, that the drama had arrived at an exalted ſtate of perfection in Aſia, at a period long prior to the moſt early hiſtory of the Greek or Roman nations. And we alſo find that the dramas of the ancient Hindoos were at that early period divided into acts. The only regular dramatic piece that has yet been tranſlated from the Shanſcrit into Engliſh is the play of "*Sacontala, or the Fatal ring*," a piece of *ſeven* acts, uniting a variety of pathetic, ſentimental colloquy, and moral precept, blended with comic humour and brilliant poetical machinery. The drama, even to this day, (1802) continues to be a favourite amuſement of the Aſiatics, and ſhort pieces, of one or two *acts*, are performed by itinerant companies, who ſubſiſt ſolely by that occupation. Theſe ſmall pieces, generally amounting to what we call interludes and after-pieces, are principally in a humorous ſtyle, and they are of various ſpecies from the refined to the coarſely ſatirical and groteſque. The actors always know their company, and as the piece is ſeldom beſpoken, the choice entirely depends on the manager or principal performer's idea of the taſte of his audience. Beſide the ordinary local topics of this petty drama, the manners and foibles of Europeans are often happily hit off, and it is an entertainment of peculiar reliſh to ſtrangers who underſtand their language, to hear and ſee the exotic paſſions, vices, and peculiarities hit off in a ſtile of ſatire worthy of Ariſtophanes. The fat Dutchman, the moroſe and purſe-proud Engliſhman, the tinſal vanity of the Portugueſe, and the gay frivolity of the Frenchman, are exhibited on theſe occaſions with great force, in manner, expreſſion, and the higheſt, but moſt ſtriking caricature. Theſe pieces of one or two acts are performed uſually on feſtive occaſions, as weddings or birth days, or on religious feſtivities where ſolemnity is not required by the letter of their inſtitutions.

Act *of faith*, Auto *da fe*, in the Romiſh church, was a ſolemn day held by the inquiſition, for the puniſhment of heretics, and the abſolution of the innocent accuſed. They uſually contrived the *auto* to fall on ſome great feſtival, that the execution might paſs with the more awe and regard: it was often on a Sunday.

The *auto da fe* may be called the laſt act of the inquiſitorial tragedy: it was a kind of gaol delivery, appointed as often as a competent number of priſoners in the inquiſition were convicted of hereſy, eitheir by their own voluntary or extorted confeſſion; or on the evidence of certain witneſſes. The following is a deſcription of a Spaniſh *auto da fe*, as taken about fifty years ago by a ſpectator. The proceſs was thus: in the morning they were brought into a great hall, where they had certain habits put on, which they were to wear in the proceſſion. The proceſſion was led by Dominican friars; after whom came the penitents, ſome with ſan-benetoes, and ſome without, according to their crimes; being all with black coats without ſleeves, and bare footed, with each a wax candle in their hands. Theſe were followed by the penitents who had narrowly eſcaped being burnt, who over their coats had flames painted, with the flames downwards, *fuego revolto*. Next came the negative and relapſed, who were to be burnt, having flames on their habits pointing upwards: after theſe came ſuch as profeſſed doctrines contrary to the faith of Rome, who, beſides flames pointing upwards, had their picture painted on their breaſts, with dogs, ſerpents, and devils, all open-mouthed, about it. Each priſoner was attended with a familiar of the inquiſition; and thoſe to be burnt had alſo a Jeſuit on each hand, who continually preached to them to abjure. After the priſoners came a troop of familiars on horſe-back; and after them the inquiſitors, and other officers of the court on mules; laſt of all the inquiſitor general on a white horſe, led by two men, with black hats, and green hat-bands. A ſcaffold was erected in the Terreiro de Paie, big enough for two or three thouſand perſons; at one end of which were the priſoners, at the other the inquiſitors. After a ſermon made up of encomiums on the inquiſition, and invectives againſt heretics, a prieſt aſcended a deſk near the middle of the ſcaffold, and having taken the abjuration of the penitents, recited the final ſentence of thoſe that were to be put to death; and delivered them to the ſecular arm, earneſtly beſeeching, at the ſame time, the ſecular power not to touch their blood, or put their lives in danger! The priſoners being thus in the hands of the civil magiſtrates, were preſently loaded with chains, and carried firſt to the ſecular gaol, and from thence in an hour or two brought before the civil judge, who, after aſking in what religion they intended to die, pronounced ſentence on ſuch as declared they would die in the communion of the church of Rome, that they ſhould be firſt ſtrangled, and then burnt to aſhes; on ſuch as died in any other faith, that they be burnt alive. Both were immediately carried to the Ribera, the place of execution, where there were as many ſtakes ſet up as there were priſoners to be burnt, with a quantity of dry furze about them.

The ſtakes of the profeſſed, that is ſuch as perſiſted in their hereſy, were about four yards high, having a ſmall board towards the top, for the priſoner to be ſeated on. The negative and relapſed, being firſt ſtrangled and burnt, the profeſſed mounted their ſtakes by a ladder; and the Jeſuits, after ſeveral exhortations to be reconciled to the church, parted with them, telling them they left them to the devil, who is ſtanding at their elbow to receive their ſouls, and carry them with him into the flames of hell. On this a great ſhout was raiſed, and the cry was "Let the dogs beards be made," which was done by thruſting flaming furze, faſtened to long poles, againſt their faces, till their faces were burnt to a coal, which was accompanied with the loudeſt acclamations of joy. At laſt fire was ſet to the furze at the bottom of the ſtake, over which the profeſſed were chained ſo high, that the top of the flame ſeldom reached higher than the ſeat they ſat on, ſo that they rather ſeemed roaſted than burnt. There could not be a more lamentable ſpectacle; the ſufferers continually crying out while they are able, *Miſericordia per amor di Dios:* or, "Pity for the love of God;" yet it was beheld by all ſexes, and ages, with tranſports of joy and ſatisfaction Geddes's Miſc. Tracts, tom. i. p. 442. Limb. Hiſt. Inq. lib. iv. The *auto da fe* was formally aboliſhed in Portugal in 1752. It appears to have been aboliſhed in Spain likewiſe, though the inquiſition ſtill ſubſiſts in both theſe countries, and theſe alone.

To Act, *v. a.* 1. to bear a borrowed character; as, a ſtage-player.–2. To counterfeit; to feign by action.–3. To actuate; to put in motion; to regulate the movements.

To Act, *v. a.* 1. To be in action, not to reſt.–2. To perform the proper functions.–3. To practice arts or duties; to conduct one's ſelf.–4. To produce effects in paſſive ſubjects.

Act, Actus, in phyſics, an effective exerciſe or application of ſome power or faculty. In this ſenſe, *act* ſtands oppoſed to power, *potentia*, which is only the capacity of acting, not the exertion of that capacity.—Metaphyſicians give various diviſions of act: viz. into infinite, as the act of creating; and finite, as the act of moving;—tranſient, or thoſe exerciſed in other beings, as heating; and immanent, which remain in their own ſubject, as thinking.

ACTA, Acts, denote alſo the deliberations and reſolutions of an aſſembly, ſenate, or convention; as acts of parliament, &c. Likewiſe matters of fact tranſmitted to poſterity in certain authentic books and memoirs.

Acta Consistorii, the edicts or declarations of the council of ſtate of the emperors. Theſe edicts were generally expreſſed in ſuch terms as theſe: "The auguſt emperors, Diocleſian and Maximillian, in council declared, that the children of Decuritus ſhould not be expoſed to wild beaſts in the amphitheatre."—The ſenate and ſoldiers often ſwore, either through abject flattery or by compulſion, upon the edicts of the emperor, as we do upon the bible. And the name of Apidius Merula was eraſed by Nero out of the regiſter of ſenators, becauſe he refuſed to ſwear upon the edicts of the Emperor Auguſtus.

Acta Diurna, the Daily Acts, was a ſort of Roman gazette, containing an authorized narrative of the tranſactions worthy of notice which happened at Rome. Petronius has given us a ſpecimen of the acta diurna in his account of Trimalchis; and as it may not perhaps be unentertaining to ſee in what ſtyle a Roman Newſpaper ran, the following is given as a ſpecimen of it, "On the 26th of July, thirty boys and forty girls were born of Trimalchi's eſtate at Cuma.—At the ſame time, a ſlave was put to death for uttering diſreſpectful words againſt his lord.—The ſame day a fire broke out in Pompey's gardens, which began in the night, in the ſteward's apartment."

Acta Populi, Acts of the People, among the Romans, were journals or regiſters of the daily occurrences; as aſſemblies, trials, executions, buildings, births, marriages, deaths, &c. of illuſtrious perſons, and the like. Theſe were otherwiſe called *Acta Publica* and *Acta Diurna*, or ſimply *Acta*. The *Acta* differed from Annals, in that only the greater and more important matters were in the latter, and thoſe of leſs note were in the former. Their origin is attributed to Julius Cæſar, who firſt ordered the keeping and making public the acts of the people. Some trace them higher, to Servius Tullius, who, to diſcover the number of perſons born, dead, and alive, ordered that the next of kin, upon a birth, ſhould put a certain piece of money into the treaſury of Juno Lucina; upon a death, into that of Venus Libitina: the like was alſo to be done upon aſſuming the toga virilis, &c. Under Marcus Antonius, this was carried further: perſons were obliged to notify the births of their children, with their names and ſurnames, the day, conſul, and whether legitimate or ſpurious, to the præfects of the Ærarium Saturni, to be entered in the public acts; though before this time the births of perſons of quality appear only to have been thus regiſtered.

Acta Senatus, acts of the ſenate, among the Romans, were minutes of what paſſed and was debated in the ſenate houſe. Theſe were alſo called *Commentarii*, and by a Greek name *upomnemata*. They had their origin in the conſulſhip of Julius Cæſar, who ordered them both to be kept and publiſhed. The keeping them was continued under Auguſtus, but the publication was abrogated. Afterwards all writings, relating to the degrees or ſentences of the judges, or what paſſed and was done before them, or by their authority, in any cauſe, were alſo called by the name *Acta:* In which ſenſe we read of civil acts, criminal acts, intervenient acts; acta civilia, criminalia, interveniemtia, &c.

ACT and Commission, in law, the extracted warrant of a judge a judge to the perſon therein named for taking a proof of witneſſes, &c. and to report.

ACT OF CURATORY, in law, the deed of a court, authoriſing curators who are elected by a minor, to manage his affairs.

ACT OF GRACE. See GRACE.

ACTÆA, ACONITUM RACEMOSUM, HERB CHRISTOPHER, or BANE-BERRIES; a genus of the monogynia order, belonging to the polyandria claſs of plants. The characters are: The calyx is a perianthium conſiſting of four roundiſh, obtuſe, concave leaves, which fall off. The corolla conſiſts of four petals, larger than the calyx, pointed at both ends, and falling off. The ſtamina conſiſts of numerous capillary filaments; the antheræ are roundiſh, erect, and didymous. The piſtillum has an ovate german; no ſtylus; the ſtigma thickiſh, and obliquely depreſſed. The pericarpium is an oval ſmooth one-furrowed one-celled berry. The ſeeds are very numerous, ſemiorbicular, and incumbent in a double order. This genus is aſſociated with the Multiſiliquæ, the 26th natural order. There are four ſpecies; viz.

1. ACTÆA ALBA, or the American herb Chriſtopher, which is a native of the United States. The leaves of this ſpecies are ſomewhat like the common herb Criſtopher, but not ſo deeply indented in the edges. The flowers grow in a more compact ſpike, and the berries are very white and tranſparent when ripe; and the roots are compoſed of thick knobs. This ſpecies has been uſed as an emetic, and ſometimes called *ipecacoanba.* It may be propagated either by ſeeds, or parting the roots. The ſeeds ſhould be ſown in a ſhady border; and ſhould not be diſturbed till the following autumn, when they ſhould be tranſplanted, and allowed to remain and flower.—The plants ſhould be allowed 3 feet every way, on account of their wide ſpreading leaves. This ſpecies delights in a light moiſt ſoil, and a ſhady ſituation.

2. ACTÆA CIMICIFUGA, is a native of Siberia; the leaves reſemble thoſe of the feathered columbine; the ſtalks riſe little more than a foot high, ſupporting particles of white flowers, which appear in May. It requires a ſimilar ſoil, and may be propagated in the ſame manner as the laſt.

3. ACTÆA RACEMOSA, or American black or wild ſnake-root, is likewiſe a native of the United States. It has likewiſe large compound leaves, riſing immediately from the root, and branched after the ſame manner as the firſt, which grow more than 2 feet high. The flower ſtem riſes to the height of 4 or 5 feet; and carries a long ſpike of white flowers reflexed at the top. The root of this plant is greatly uſed by phyſicians in the United States, in many diſorders; and is ſuppoſed to be an antidote againſt poiſon, or the biting of a rattleſnake. It thrives in the ſame kind of ſoil as the former; and is very hardy, requiring no other culture than the common flowering ſhrubs. The plants ſhould not be often removed, for that will prevent their flowering ſtrong.

4. ACTÆA SPICATA, or common herb Chriſtopher, grows to the height of about 2 feet and a half; the foot-ſtalks of the leaves ariſe from the root; and divide into three ſmaller foot-ſtalks, each of which are again divided into 3, and theſe have each 3 lobes; ſo that each leaf is compoſed of 27 lobes or ſmaller leaves. The flowers grow in ramous ſpikes, and are of a pure white; they are borne upon a ſlender jointed, and furrowed ſtem; appear in May; and are ſucceeded by black ſhining, pulpy berries, about the ſize of peas, which ripen in autumn. This plant is a powerful repellent, and the root has been uſed internally in ſome nervous caſes, but muſt be adminiſtered with caution. The berries are highly poiſonous. It is ſaid toads reſort to this plant, on occount of its fetid ſmell. Sheep and goats eat it; cows, horſes, and ſwine, refuſe it. It may be propagated either by ſeeds or parting the roots. The ſeeds ſhould be ſown in a ſhady border ſoon after they are ripe, or they will lie a whole year in the ground before they vegetate. As all the plants do not come up at the ſame time, they ſhould not be diſturbed till the following autumn, when they ſhould be tranſplanted.

ACTANIA, an iſland, according to Pliny, in the North Sea. It lies to the weſt of Holſtein and Ditmerſch, not far from the mouth of the Eyder and Elbe, and is called *Heyligland.*

ACTINIA, in zoology, a genus belonging to the order of vermes molluſca. The body is oblong and ſmooth, attaching itſelf firmly by its baſis to rocks or other ſolid ſubſtances, having a dilatable apex hooked within. The mouth is furniſhed with crooked teeth, the roſtrum cylindrical and radiated. There are five ſpecies, ſome of which make a beautiful appearance, and are called *Animal Flowers*, *Sea Anemonies*, and *Utica Marina.* They form one of thoſe wonderful links in the chain of creation, that connect the animal and vegetable kingdoms, by partaking of the nature of both. They are found on the coaſts of the American Iſlands; and from Sir J. Sinclair's ſtatiſtical account of the pariſhes of Urr and Colvend, it appears, that they are found in as great beauty and variety on the coaſt of Galloway, as any where in the Weſt Indies. See ANIMAL FLOWER. Several of the ſpecies are fixed like vegetables; in others, progreſſive motion is ſo ſlow, that it is difficult to perceive any, as they ſcarcely advance the length of one inch in an hour. It would ſeem they do not all produce, when handled, the painful ſenſation which had acquired them the name of *Sea-nettles.*—They are viviparous, feed on ſhell fiſh, open their mouth more or leſs according to the ſize of the prey they have to deal with, and then reject the ſhell through the ſame aperture. When the mouth is open, all the tentacula of the actinia may be ſeen, reſembling in that ſituation a full blown flower, which has given it the denomination of the *flower-fiſh.*

ACTIO, in Roman antiquities, an action at law, in a court of juſtice. The formalities uſed by the Romans, in judicial actions, were theſe: If the difference failed to be made up by friends, the injured perſon proceeded *in jus reum vocare*, to ſummon the offending party to the court, who was obliged to go, or give bond for his appearance. He could be ſummoned into court *viva voce*, by the plaintiff himſelf meeting him, declaring his intention, and commanding him to go before the magiſtrate. If he would not go willingly, he might drag and force him along, unleſs he gave ſecurity for his appearance on ſome appointed day. If he failed to appear on the day agreed on, then the plaintiff, whenſoever he met him, might take him along with him by force, calling any by-ſtanders to bear witneſs, by aſking them *visne antestari;* the by-ſtanders upon this turned their ear, towards him in token of their conſent:

To this Horace alludes, Lib. 1. Sat. 9. See Antestari. Both parties being met before the prætor, or other magiſtrate preſiding in the court, the plaintiff ſtated the action to the defendant; in which he deſigned to proſecute him. This they termed *edere actionem*; and was commonly performed by writing it in a tablet, and offering it to the defendant, that he might ſee whether he had better ſtand the ſuit or compound. Next came the *postulatio actionis*, or the plaintiff's petition to the prætor, for leave to proſecute the defendant. The petition was granted by writing at the bottom of it *actionem do*, or refuſed by writing *non do*. The petition being granted, the plaintiff *vadabatur reum*, i. e. obliged him to give ſureties for his appearance on ſuch a day in the court; and this was all that was done, before the day fixed for the trial. Mean time, the difference was often made up, either *transactione*, by letting the cauſe fall as dubious; or *paetione*, by compoſition for damages. On the day appointed, the prætor ordered the ſeveral bills to be read, and the parties ſummoned by an *accensus*. See Accensi. Upon the non-appearance of either party, the defaulter loſt his cauſe; if they both appeared, they were ſaid *se stetisse*; and then the plaintiff proceeded *litem sive actionem intendere*, i. e. to prefer his ſuit, which was done in a ſet form of words, varying according to the difference of the actions. After this the plaintiff deſired judgment of the prætor, that is to be allowed a *judex* or *arbiter*, or elſe the *recuperatores* or *centumviri*. Theſe he requeſted for the hearing and deciding the buſineſs; but none of them could be deſired but by the conſent of both parties. The prætor having aſſigned them their judges, defined and determined the number of witneſſes to be admitted, to hinder the protracting of the ſuit; and then the parties proceeded to give their caution, that the judgment whatever it was, ſhould ſtand and be performed on both ſides. The judges took a ſolemn oath to be impartial; and the parties took the *juramentum calumniæ*. Then the trial began with the aſſiſtance of witneſſes, writings, &c. which was called *disceptio causæ*.

ACTION. *n. s.* 1. The quality or ſtate of acting, oppoſite to *rest.*—2. An act or thing done; a deed.—3 Agency operation.—4. The ſeries of events repreſented in a fable. —5. Geſticulation; the accordance of the motions of the body with the words ſpoken; a part of oratory.

Action, in law; it is uſed with the prepoſition *against* before the perſon, and *for* before the thing. *Actions* are perſonal, real, and mixt: *action* perſonal belongs to a man *against* another, by reaſon of any contract, offence, or cauſe, of like force with a contract or offence made or done by him or ſome other, for whoſe fact he is to anſwer. *Action* real is given to any man againſt another, that poſſeſſes the thing required or ſued for in his own name, and no other man's. *Action* mixt, is that which lies as well *against* or *for* the thing which we ſeek, as *against* the perſon that hath it; called *mixt*, becauſe it hath a mixt reſpect both to the thing and to the perſon. *Action* is divided into civil, penal, and mixt. *Action* civil is that which tends only to the recovery of that which is due to us; as a ſum of money formerly lent. *Action* penal is that which aims at ſome penalty or puniſhment in the party ſued, be it corporal or pecuniary: as, in common law, the next friends of a man feloniouſly ſlain ſhall purſue the law *against* the murderer. *Action* mixt is that which ſeeks both the thing whereof we are deprived, and a penalty alſo for the unjuſt detaining of the ſame. *Action upon the case* is an *action* given for redreſs of wrongs done without force *against* any man, by law not ſpecially provided for. *Action upon the statute*, is an *action* brought *against* a man upon breach of a ſtatute.

Action, by grammarians, is diſtinguiſhed from *act*; the former being generally reſtricted to the common or ordinary traſactions, the latter uſed to expreſs thoſe which are remarkable. Thus, we ſay it is a good action to comfort the unhappy: it is a generous act to deprive ourſelves of what is neceſſary for their ſake. The wiſe man propoſes to himſelf an honeſt end in all his actions; a prince ought to mark every day of his life with ſome act of greatneſs. The Abbe Girard makes a further diſtinction between the words action and act. The former, according to him, has more relation to the power that acts than the latter; whereas the latter has more relation to the effect produced than the former: and hence the one is properly the attribute of the other. Thus we may properly ſay, "Be ſure to preſerve a preſence of mind in all your actions and take care that they be all acts of equity."

Action, in affairs of commerce, or action of a company is a part or ſhare in the company's ſtock or capital, which conſiſts of a number of ſuch actions. Actions in France and Holland under their old eſtabliſhments, amounted to the ſame with ſhares or ſubſcriptions in England, and with bank ſhares or ſtock in the Bank of the United States, and ſimilar banks. Thus, the capital of a company, which had three hundred actions of a thouſand livres each, in France, conſiſted of three hundred thouſand livres. Hence a perſon was ſaid to have four or ſix actions in ſuch company, if he had contributed to the capital, and was intereſted in it, for four or ſix thouſand livres. A proprietor cannot have a deliberate vote in the aſſemblies of a company, unleſs he has a certain number of actions, fixed by the condition of its eſtabliſhment; nor can he be a director unleſs he has a ſtill greater numbet of actions. Action alſo denotes an obligation or inſtrument, which the directors of ſuch companies deliver to thoſe who pay money into their ſtock. See Actionary. Actions are always riſing and falling, according as the company's credit gains or loſes. The ſmalleſt whiſper of an approaching war or peace, true or falſe, will frequently occaſion a conſiderable alteration in it. In the year 1719, the French company of the Weſt, afterwards called the India Company, arrived at ſuch an immenſe degree of credit, that in ſix months time its actions roſe to 18 per cent. a degree of temporary credit which no other company ever attained. In 1672, the actions of the Dutch Eaſt India Company were at 660 per cent. and they were never known to be higher. But the war with France then coming on, they fell 250 per cent. in a few months. After the peace of Nimeguen they roſe again; and in 1718 were 600 per cent. See Bank.

Action, in ethics, denotes the external ſigns or expreſſions of the ſentiments of a moral agent. See Active power.

Action, in farriery, ſpoken of a horſe, the agitation of the tongue and mandible, which is a ſign of metal.

Action, in mechanics, implies either the effort which a body or power makes againſt another body or power, or the effect itſelf of that effort. As it is neceſſary in works of this kind to have a particular regard to the common language of mechanics and philoſophers, we have given this double definition: but the proper ſignification of the term is the motion which a body really produces, or tends to produce, in another; that is, ſuch is the motion it would have produced, had nothing hindered its effect. All power is nothing more than a body actually in motion, or which tends to move itſelf; that is, a body which would move itſelf, if nothing oppoſed it. The action therefore of a body is rendered evident to us by its motion only; and conſequently we muſt not fix any other idea to the word action, than that of actual motion, or a ſimple tendency to motion. The famous queſtion relating to *vis viva*, and *vis mortua*, owes, in all probability, its exiſtence to an inadequate idea of the word action; for had Leibnitz and his followers obſerved, that the only preciſe and diſtinct idea we can give to the word force or action, reduces it to its effect, that is, to the motion it actually produces or tends to produce, they would never have made that curious diſtinction.

Action, in oratory, is the outward deportment of the orator, or the accommodation of his countenance, voice, and geſture, to the ſubject of which he is treating. See Oratory.

Action, in painting and ſculpture, is the attitude or poſition of the ſeveral parts of the face, body, and limbs of ſuch figures as are repreſented, and whereby they ſeem to be really actuated by paſſions. Thus we ſay, the action of ſuch a figure finely expreſſes the paſſions with which it is agitated: we alſo uſe the ſame expreſſion with regard to animals.

Action, in phyſiology, is applied to the functions of the body, whether vital, animal, or natural. The *vital* actions or functions, are thoſe which are abſolutely neceſſary to life, and without which there is no life, as the action of the heart, lungs, and arteries. On the action and re-action of the ſolids and fluids on each other, depend the vital functions. Pulſation and reſpiration are the external ſigns of life. Mortal diſeaſes are all thoſe which impede vital actions; ſuch as the influx of the venous blood into the cavities of the heart, and the expulſion of the arterial blood from the ſame. The *natural* functions are thoſe which are inſtrumental in repairing the ſeveral loſſes which the body ſuſtains; for life is deſtructive of itſelf, its very offices occaſioning a perpetual waſte. The manducation of food, the deglutition and digeſtion thereof, alſo the ſeparation and diſtribution of the chyle and excrementitious parts, &c. are under the head of natural functions, as by theſe our aliment is converted into our nature. They are neceſſary to the continuance of our bodies. The *animal* functions are thoſe which we perform as well as muſcular motion, and all the voluntary actions of the body: they comprehend the ſenſes of touch, taſte, ſmell, ſight, and hearing; and the faculties of perception, reaſoning, imagination, memory, and judgment, with the affections of the mind. Without ſome of them, a man may live, though not ſo comfortably as with them; but deprived of them all, he could not exiſt, or, ſuppoſing that poſſible, would not be conſcious of exiſtence.

Action, in poetry, the ſame with ſubject or fable. Critics generally diſtinguiſh two kinds; the principal and the incidental. The principal action is what is generally called *fable*; and the incidental an *epiſode*. See Poetry.

Action in, or proper for the pulpit. See Declamation.

Action, in ſculpture. See Sculpture.

Action, in the theatrical ſenſe. See Declamation.

ACTIONS, among merchants, ſometimes ſignify moveable effects; and we ſay the merchant's creditors have ſeized on all his actions, when we mean that they have taken poſſeſſion of all his active debts.

ACTIONABLE, *adj.* that which admits an action in law to be brought againſt it; puniſhable.

ACTIONARY, or **Actionist**, *n. s.* one who has a ſhare in *actions* or ſtocks.

ACTIVE, **Activus**, *adj.* ſomething that communicates motion or action to another. In this ſenſe the word ſtands oppoſed to *paſſive*. Thus we ſay, an active cauſe, active principle, &c. The quantity of motion in the world, Sir Iſaac Newton ſhews, muſt be always decreaſing, in virtue of the *vis inertiæ*, &c. So that there is a neceſſity for certain active principles to recruit it: ſuch he takes the cauſe of gravity to be, and the cauſe of fermentation. Adding, that we ſee but little motion in the univerſe, except what is owing to theſe active principles.

Active power, in metaphyſics, the power of executing any work or labour; in contradiction to ſpeculative powers, or the powers of ſeeing, hearing, remembering, judging, reaſoning, &c. The exertion of active power we call action: and as every action produces ſome change, ſo every change muſt be cauſed by ſome effect, or by the ceſſation of ſome exertion of power. That which produces a change by the exertion of its power, we call the cauſe of that change; and the change produced, the effect of that cauſe.

Active principles, in chemiſtry, are thoſe which are ſuppoſed to act of themſelves, and do not need to be put in action by others. Salt, ſulphur, and mercury, are uſually conſidered by the chemiſts as active principles; and phlegm and earth as paſſive ones. Mr. Homberg, and ſome late chemiſts after him, only make one active principle, viz. ſulphur, or fire, which they take to be the ſource or principle of all the motion and action of the univerſe. The term active principles, ſays Dr. Quincy, has been uſed to expreſs certain diviſions of matter, that are, by ſome particular modifications, comparatively active in reſpect of others: ſuch are ſpirit, oil, and ſalt, whoſe parts are better fitted for motion than thoſe of earth and water; but with how much impropriety will eaſily appear. For in a ſtrict ſenſe, all motion in matter is rather paſſion; and there is no active principle, unleſs we thus call the known powers of gravitation, attraction, and repulſion, on which the Newtonian ſyſtem is founded: ſo that let bodies exiſt under what modification ſoever, there can be no alteration made of theſe univerſal properties. Hence the diviſion of matter into what, for diſtinction's ſake, may be called *ſpirit*, does not give it any properties inconſiſtent with this general law.

Active, in grammar, denotes a word having a ſignification that ſerves to explain or denote an action. Thus we ſay, a verb active, a conjugation active, &c. or an active participle.

Active verbs are ſuch as do not only ſignify doing, or acting, but have alſo nouns following them, to be the ſubject of the action or impreſſion. Thus *to love, to teach*, are verbs active; becauſe we can ſay, *to love a thing, to teach a man*.

Verbs *neuter* alſo denote an action, but are diſtinguiſhed from verbs active in that they cannot have a noun following them. Such are *to ſleep*, *to go*, &c.

Some grammarians, however, make three kinds of verbs active : the *tranſitive*, where the action paſſes into a ſubject different from the agent ; *reflected*, where the action returns upon the agent ; and *reciprocal*, where the action turns mutually upon the two agents who produced it. See GRAMMAR.

ACTIVITY, *n. s.* the power of acting, or the active faculty. The activity of fire exceeds all imagination.—The activity of an acid, a poiſon, &c. Bodies, according to Sir Iſaac Newton, derive their activity from the principle of attraction.

The ſphere of ACTIVITY of the body, is the ſpace which ſurrounds it, ſo far as its efficacy or virtue extends to produce any ſenſible effect.

ACTIUM, in ancient geography, a town ſituated on the coaſt of Arcania, in itſelf inconſiderable, but famous for a temple of Apollo, a ſafe harbour, and an adjoining promontory of the ſame name, in the mouth of Sinus Ambracius, over againſt Nicopolis on the other ſide of the bay. It afterwards became ſtill more famous by Auguſtus's victory over Antony and Cleopatra ; and for quinquennial games inſtituted there, called *Actia* or *Ludi Actiaci*.

ACTIUM, the promontory of, now called *Cadi di Figalo*.

ACTOR, *n. s.* in general, ſignifies a perſon who acts or performs ſomething. Actor, among European civilians, is the proctor or advocate in civil courts or cauſes : as *actor eccleſiæ* has been ſometimes uſed for the advocate of the church ; *actor dominicus* for the lord's attorney ; *actor villæ*, the ſteward or head bailiff of a village.

ACTOR, in the drama, is a perſon who repreſents ſome part or character upon the theatre. The drama conſiſted originally of nothing more than a ſimple chorus, who ſang hymns in honour of Bacchus ; ſo that the primitive actors were only ſingers and muſicians. Theſpis was the firſt perſon mentioned in claſſic hiſtory, who in order to eaſe this unformed chorus, introduced a declaimer, who repeated ſome heroic or comic adventure. Æſchylus, finding a ſingle perſon tireſome, attempted to introduce a ſecond, and changed the ancient recitals into dialogue. He alſo dreſſed his actors in a more majeſtic manner, and introduced the *cothurnus*, or buſkin. Sophocles added a third, in order to repreſent the various incidents in a more natural manner : and here the Greeks ſtopped ; at leaſt we do not find in any of their tragedies above three perſons in the ſame ſcene. Perhaps they looked upon it as a rule of the dramatic poem, never to admit more than three ſpeakers at a time on the ſtage ; a rule which Horace has expreſſed in the following verſe :

Nec quarta loqui perſona laboret.

Croud not the ſtage, this uſeful rule regard,
More than three ſpeakers in one ſcene's abſurd.

This, however, did not prevent their increaſing the number of actors in comedy. Before the opening of the play they named their actors in full theatre, together with the parts they were to perform. The ancient actors were maſked, and obliged to raiſe their voices extremely, in order to make themſelves heard by the innumerable crowd of people who filled the amphitheatres : they were accompanied with a player of the flute, who played a prelude, gave them the tone, and played while they declaimed. Horace ſpeaks of a kind of ſecondary actors, in his time, whoſe buſineſs was to imitate the firſt, and leſſen themſelves to become better foils to their principals. The moderns have introduced an infinite number of actors on the ſtage. This heightens the trouble and diſtreſs that ſhould reign there, and makes a diverſity, in which the ſpectator is ſure to be intereſted. Actors were highly honoured at Athens. At Rome they were deſpiſed ; and not only denied all rank among the citizens, but even when any citizen appeared upon the ſtage, he was expelled his tribe, and deprived of the right of ſuffrage by the cenſors. Cicero, indeed, eſteems the talents of Roſcius ; but he values his virtues ſtill more ; virtues which diſtinguiſhed him ſo remarkably above all others of his profeſſion, that they ſeemed to have excluded him from the theatre. The French for a long time adopted the ideas of the Romans : and the Engliſh thoſe of the Greeks ; in all poliſhed nations they poſſeſs at this time that ſhare of reſpect due to their private worth and talents.

ACTRESS, *n. s.* in a general ſenſe, as well as in the drama in particular, is a female who acts or performs ſomething. Women actors were unknown to the Greeks and Romans, among whom men always performed the female characters ; and thence one reaſon for the uſe of maſks among them. Actreſſes are ſaid not to have been introduced on the Engliſh ſtage till after the reſtoration of Charles II. who has been charged with contributing to the corruption of manners by importing this uſage from abroad. But this can be but partly true : the queen of James I. acted a part in a paſtoral ; and Prynn, in his Hiſtriomaſtrix, ſpeaks of the women actors in his time as whores ; which was one occaſion of the ſevere proſecution brought againſt him for that book. There are ſome very agreeable and beautiful talents, for which the poſſeſſion commands a ſort of admiration ; but of which the exerciſe, for the ſake of gain, is conſidered, from prejudice, as a ſort of public proſtitution. The pecuniary recompence, therefore, of thoſe who exerciſe them in this manner, muſt be ſufficient, not only to pay for the time, labour, and expence of acquiring the talents, but for the diſcredit which attends the employment of them as the means of ſubſiſtence. The exorbitant rewards of players, opera-ſingers, opera-dancers, &c. in Europe, are founded upon theſe two principles ; the rarity and beauty of the talents, and the diſcredit of employing them in this manner. It ſeems abſurd, at firſt ſight, to deſpiſe their perſons, and yet reward their talents with the moſt profuſe liberality. While one is done, however, the other muſt of neceſſity be done ; were the public opinion or prejudice to alter with regard to ſuch occupations, their pecuniary recompence would quickly diminiſh. More people would apply to them and the competition would quickly reduce the price of their labour. Such talents, though far from being common, are by no means ſo rare as is imagined. Many people poſſeſs them in a great perfection, who diſdain to make this uſe of them ; and many more are capable of acquiring them, if any thing could be made honourably by them.

ACTS OF CONGRESS are particularly denominated laws or ſtatutes. The acts of the Philadelphia Society are called *Tranſactions* ; thoſe of the old Academy of Sciences at Paris, were called *Memoirs;* thoſe of the ſocieties of Leipſic, &c. ſimply *Acts*, *Acta eruditorum*, &c.

Acts of the United States, and all copies of records and papers in the State office, ſhall be authenticated and become evidence of equal authority with the original, when iſſued under the ſeal of the ſecretary of ſtate. Laws of U. S. 1ſt. Seſſ. Con. c. xiv. § 5.

Acts of the individual ſtates are by law to have full faith and credit in each of the other ſtates; and Congreſs may by general laws, preſcribe the manner in which ſuch acts, records, and proceedings ſhall be proved, and the effect thereof. Federal conſtitution. Art. iv. § 1.

Acts of the legiſlatures of the ſeveral ſtates ſhall be authenticated, by having the ſeal of their reſpective ſtates affixed thereto, : and the records and judicial proceedings of the courts of any ſtate, ſhall be proved and admitted in any other court within the United States, upon the atteſtation of the clerk, and the ſeal of the court being annexed, together with a certificate of the judge, juſtice, or preſiding magiſtrate, that the atteſtation is in due form. Laws of U. S. 2d. Seſſ. 1ſt. Con. c. xi.

Acts of the Apostles, and of the ſacred books of the New Teſtament, containing the hiſtory of the infant church, during the ſpace of 29 or 30. years, from the aſcenſion of our Lord to the year of Chriſt 63.—It was written by St. Luke, and addreſſed to Theophilus, the perſon to whom the evangeliſt had before dedicated his goſpel. We here find the accompliſhment of ſeveral of the promiſes made by our Saviour; his aſcenſion; the deſcent of the Holy Ghoſt; the firſt preaching of the apoſtles, and the miracles whereby their doctrines were confirmed; an admirable picture of the manners of the primitive Chriſtians; and, in ſhort, every thing that paſſed in the church till the diſperſion of the apoſtles, who ſeparated themſelves in order to propagate the goſpel throughout the world. From the period of that ſeparation, St. Luke quits the hiſtory of the other apoſtles, who were then at too great a diſtance from him, and confines himſelf more particularly to that of St. Paul, who had choſen him for the companion of his labours. He follows that apoſtle in all his miſſions, and even to Rome itſelf; for it appears that the Acts were publiſhed in the 2d year of St. Paul's reſidence in that city, or the 56th year of the Chriſtian æra, and in the 9th or 10 year of Nero's reign. The ſtyle of this work, which was, originally compoſed in Greek, is much purer than that of the other canonical writers; and it is obſervable that St. Luke, who was much better acquainted with the Greek than with the Hebrew language, always in his quotations from the Old Teſtament, makes uſe of the Septuagint verſion. The council of Laodicea places the Acts of the Apoſtles among the canonical books, and the churches have acknowledged it as ſuch without any controverſy.

Acts of the Apostles, spurious: Of theſe there were ſeveral, particularly; I. *Acts*, ſuppoſed to be written by Abdias, the pretended biſhop of Babylon, who gave out that he was ordained biſhop by the apoſtles themſelves, when they were upon their journey into Perſia. II. *The Acts of St. Peter;* this book came originally from the ſchool of the Ebionites. III. *The Acts of St. Paul*, which is entirely loſt. Euſebius, who has ſeen it, pronounces it of no authority. IV. *The Acts of St. John the Evangelist:* a book made uſe of by the Eucratites, Manichæans, and Priſcillianiſts. V. *The Acts of St. Andrew;* received by the Manichæans, Eucratites, and Apotactics. VI. *The Acts of St. Thomas the Apostle;* received particularly by the Manichæans. VII. *The Acts of St. Philip.* This book the Gnoſtics made uſe of. VIII. *The Acts of St. Matthias.* Some have imagined that the Jews for a long time had concealed the original acts of the life and death of St. Matthias, written in Hebrew; and that a monk of the abbey of St. Matthias at Treves, having got them out of their hands, procured them to be tranſlated into Latin, and publiſhed them; but critics will not allow them to be authentic.

Acts of Councils. Theſe differed from canons, in that the latter contained only the reſults, or the laws and regulations agreed on, and drawn up in form: whereas the acts included the preceding debates, motions, &c. In the firſt collections of councils, only the bare canons were delivered. Afterwards they began to give the acts as well as the canons. Hence we have too kinds of ſynodical collections; one containing acts, or tranſactions, relating to matters of faith and doctrine; the other, containing only the canons relating to diſcipline, called the book of Canons.

Acts of Pilate; a relation ſent by Pilate to the emperor Tiberius, concerning Jeſus Chriſt, his death, reſurrection, aſcenſion, and the crimes of which he was convicted before him. It was a cuſtom among the Romans, that the proconſuls and governors of provinces ſhould draw up acts, or memoirs, of what happened in the courſe of their government, and ſend them to the emperor and ſenate. The genuine acts of Pilate were ſent by him to Tiberius, who reported them to the ſenate; but they were rejected by that aſſembly, becauſe not immediately addreſſed to them; as is atteſted by Tertullian, in his Apol. cap. 5. and 20, 21. The heretics forged acts in imitation of them: in the reign of the emperor Maximin, the Gentiles, to throw an odium on the Chriſtian name, ſpread about ſpurious Acts of Pilate; which the emperor, by a ſolemn edict, ordered to be ſent into all the provinces of the empire, and enjoined the ſchoolmaſters to teach and explain them to their ſcholars, and make them learn them by heart. Theſe acts, both the genuine and ſpurious, are loſt. There is indeed extant, in the Pſeudo-Hegiſippus, a letter from Pilate to the emperor Claudius, concerning Jeſus Chriſt; but it diſcovers itſelf, at firſt ſight, not to be authentic.

Acts, public. The knowledge of public acts forms part of a peculiar ſcience, called the Diplomatic, of great importance to the hiſtorian, ſtateſman, chronologer, and even critic. The preſervation of them was the firſt occaſion of erecting libraries. The ſtyle of acts is generally barbarous Latin. Authors are divided as to the rules of judging of their genuineneſs, and even whether there be any certain rules at all. F. Germon will have the greater part of the acts of former ages to be ſpurious. Fontanini aſſerts, that the number of forged acts now exiſting is very ſmall. It is certain that there were ſeveral puniſhments inflicted on the forgers and falſifiers of acts.—The chief of the Engliſh acts, or public records, are publiſhed by Rymer, under the title of *Fœdera*, and continued by Saunderſon; an extract whereof has been given in French by Rapin, and tranſlated into Engliſh under the title of *Acta Regia.* Great commendations have been given this work: alſo ſome exceptions made to it: as that there are many ſpurious acts, as well as errors, in it; ſome have even charged it with falſifications. The public acts of the French fell into the hands of the Engliſh after the battle of Poictiers, and are commonly ſaid to have been carried by them out of the country. But the tradition is not ſupported by any ſufficient teſtimony.

ACTUAL, *adj.* 1. That which compriſes action.—2 Really in act; not merely potential.—3. In act; not purely in ſpeculation.

Actual, in medicine, is oppoſed to potential, and is applied to any thing endued with a quality which operates by an immediate power inherent in it. For example: a red-hot iron, is called an actual cautery, in contradiſtinction to chemical cauſtics, which have a power of producing the ſame effects on animal ſolids, as actual fire; and which are called potential. Boiling water is actually hot, and brandy is potentially hot, as it heats the body, though of itſelf cold.

Actual, in philoſophy is applied to heat, or cold, in oppoſition to virtual or potential.—Actual heat, conſidered actively, is the act of producing heat; paſſively taken, it is the quality whereby a body is denominated hot.—Virtual or potential heat, actively taken, is the power or faculty of producing heat; paſſively taken, it ſhould be the power or faculty of being heated, or of receiving actual heat.

Actual sin, in theology, that which is committed by the perſon himſelf; in oppoſition to original ſin, or that which he contracted from being a child of Adam.

ACTUALLY, *adv.* in fact; in effect; really.

ACTUARIÆ naves, *n. s.* a kind of ſhips among the ancient Romans, chiefly deſigned for ſwift ſailing, ſimilar in that reſpect, to what are now called brigantines.

ACTUARIOLA, *n. s.* a term uſed by Cicero, in one of his epiſtles to Atticus, for a ſhip, *decem ſcalmorum*, of ten banks of rowers.

ACTUARIUS, *n. s.* a title of dignity, in the court of Conſtantinople, peculiar to phyſicians.

Actuarius, or Actarius, *n. s.* in Roman antiquity, an officer appointed to write down the proceedings of a court, aſſembly, or the like. In the Eaſtern empire, the actuarii kept the military accounts, received the corn from the ſuſceptores, or ſtore-keepers, and diſtributed it among the ſoldiers, with whom they acted as a kind of brokers, and ſometimes advanced their pay before it became due: for which there were fixed rates.

ACTUARY, *n. s.* the regiſter who compiles the minutes of the proceedings of a court; a term of the civil law.

ACTUATE, *adj.* put into action; animated; brought into effect.

To Actuate, *v. n.* to put into action; to invigorate or increaſe the powers of motion.

ACTUATIO, *actuation*, *n. s.* ſignifies the change wrought on a medicine, or any thing elſe taken into the body, by the vital heat, which is neceſſary to make it, and produce its effect.

ACTUS, *n. s.* in ancient architecture, a meaſure in length equal to 120 Roman feet. In ancient agriculture, the word ſignified the length of one furrow, or the diſtance a plough goes before it turns. In Engliſh, it may be rendered a furlong.

Actus Intervicinalis, a ſpace of ground four feet in breadth, left between the lands as a path.

Actus Major, or Actus Quadratus, a piece of ground in a ſquare form, whoſe ſides were 120, and contents 14,400 feet, being equal to half the jugerum. It was alſo called *modius* and *mina*.

Actus Minimus, a quantity of land 120 feet in length, and four in breadth; equal to *ſextans*, or the ſixth part of a jugerum.

To ACUATE, *v. a.* to ſharpen; to invigorate with any powers of ſharpneſs.

ACUBENE, *n. s.* in aſtronomy, a name given by ſome to a ſtar on the ſouthern claw of Cancer.

ACUHYATLI, *n. s.* in zoology, the name of a very large ſerpent, of a poiſonous quality, in America, more uſually known by the name of *cucurucu*, or *cucuruca*, which ſee.

ACUITION. See Acutition.

ACULEATE, *n. s.* that which has a point or ſting; prickly; that which terminates in a ſharp point.

ACULEATED FINS, in ichthyology, a term applied by naturaliſts to the fins of fiſhes, which are armed with prickles. Thoſe which want them are called *non-aculeatea*.

ACULEATI, *n. s.* a term applied to any plants or animals, armed with prickles.

ACULEATUS longus, in ichthyology, the *pugnitius marinus*, or ſtickle-back, a ſmall prickly fiſh in the Weſt-Indies.

ACULEI, *n. s.* in botany and zoology, the ſpines or prickles of animals and plants.

ACULEOSA, *n. s.* a name of the *Carduus polyacanthos*.

ACULER, *n. s.* in the manege, is uſed for the motion of a horſe, when, in working upon volts, he does not go far enough forward at every time or motion, ſo that his ſhoulders embrace or take in too little ground, and his croupe comes too near the centre of the volt. Horſes are naturally inclined to this fault in making demi volts.

ACULEUS, *n. s.* in zoology, the ſting of a bee, ſcorpion, or the like. See Aculei.

ACUMEN, *n. s.* a ſharp point; figuratively, quickneſs of intellects.

Acumen, *n. s.* in ancient muſic, was to ſignify a ſound produced by the intention, or raiſing of the voice. Acumen differs from intention, as the effect from the cauſe.

ACUMINA, *n. s.* in antiquity, a kind of military omen, or auſpice, ſuppoſed to have been taken from the points or edges of darts, javelins, ſwords, or other weapons, viz. by examining whether they were bright or ſolid, ſharp or blunted, and predicting the iſſue of the battle accordingly.

To ACUMINATE, *v. a.* to ſharpen.

ACUMINATED, *part.* ending in a ſharp point; ſharp-pointed.

ACUMULO, a ſmall town in Abruzzo Ulterior.

ACUPUNTURE, *n. s.* a ſurgical operation among the Chineſe and Japaneſe, which is performed by pricking the part affected with a gold or ſilver needle. They employ this operation in headachs, lethargies, convulſions, cholics, &c. and even in the abdomen of women with child, when the fœtus is reſtleſs. Surgeons are furniſhed with images, wherein all the places of the body proper for the needle are deſigned by marks. M. Ten Ryne was an eye-witneſs of the uſe of this puncture on a ſoldier, who being afflicted with violent diſorders of the ſtomach, and frequent vomitings at ſea, ſuddenly relieved himſelf by pricking a thumb's breadth deep into four different places about the region of the Pylorus.

ACUS, in ichthyology, a ſpecies of Syngnathus, of which there are two varieties, viz. the Acus of Ariſtotle, or Tobacco-pipe fiſh, and the Acus of Oppian, or Gar Fiſh. See Syngnathus.

Acus, in ichthyology, the Ammodytes, or Sand-eel.

Acus Moschata, in botany, a name for the Geranium moſchatum.

Acus Pastoris, a name of the Scandix.

ACUSIO colonia, now Ancone, according to Holſtenius, between Orange and Valence, near Montelimart, on the banks of the Rhone.

ACUTE, 1. Sharp, ending in a point; oppoſed to *obtuse* or *blunt*.=2. In a figurative ſenſe applied to men; ingenious; penetrating; oppoſed to *dull* or *stupid*.—3. Vigorous; powerful in operation.

Acute Accent, that which raiſes or ſharpens the voice. See Accent.

Acute Angle, in geometry, is that which is leſs than a right angle, or which does not ſubtend 90 degrees.

Acute-angled Cone, is, according to the ancients, a right cone, whoſe axis makes an acute angle with its ſide.

Acute-angled Triangle, is a triangle whoſe three angles are all acute.

Acute-angular Section of a cone, is uſed by the ancient geometricians for the ellipſis.

Acute Diseases, are ſuch as come ſuddenly to a criſis. This term is uſed for all diſeaſes which do not fall under the head of chronic diſeaſes.

Acute, in muſic, is applied to a ſound or tone that is ſharp or high, in compariſon to ſome other tone. In this ſenſe, *acute* ſtands oppoſed to *grave*.

ACUTELLA, in botany, a name uſed by ſome to expreſs the common anonis, or reſt-harrow, a ſmall prickly plant, with red or white flowers, and famous for its ſpreading and tough root.

ACUTELY, after an acute manner; ſharply.

ACUTENESS, 1. Sharpneſs.—2. Force of intellects.—3. Quickneſs and vigour of ſenſes.—4. Violence and ſpeedy criſis of a malady.—5. Sharpneſs of ſound.

ACUTITION, in grammar, the pronouncing, or marking a ſyllable with an acute accent.

Acutition, or **Acuition**, in medicine and chemiſtry, is uſed for ſharpening or increaſing the force of any medicine.

ACYROLOGIA, an improper acceptation, or expreſſion, wherein a word or phraſe is uſed in ſome unuſual or oblique ſenſe, hardly reducible to the rules of language. Such is the word *spero*, ſometimes uſed in Roman writers for *timeo*. The acyrologia bears a near affinity to the catachreſis, inſomuch that divers expreſſions, alledged as inſtances of the latter, are by others brought as examples of the former.

AD, a Latin propoſition, ſignifying *to*, and frequently uſed in compoſition both with and without the *d*, to expreſs the relation of one thing *to* another.

Ad Bestias, in antiquity, a puniſhment of criminals; condemned to be thrown to wild beaſts. It was alſo applied to gladiators hired to fight with wild beaſts, otherwiſe called *Bestiarii*.

Ad Extra, in theology, a term uſed in ſpeaking of the external operations of God; ſuch, as, creation, preſervation, renovation, &c. See Ad Intra.

Ad Hominem, in logic, an argument drawn from the principles and prejudices of thoſe with whom we argue, and which of conſequence muſt be concluſive to them, though diſbelieved by us; or, where a diſputant quits his own language and ſyſtem, and borrows that of his opponent to convince him, by turning his own prejudices or errors againſt himſelf.

Ad Intra, in theology, is underſtood of thoſe acts of the Divine Being, whoſe term and effect is within his own eſſence: in which ſenſe, acts or operations, *ad intra*, ſtand oppoſed to thoſe *ad extra*.

Ad Libitum, is ſometimes uſed in muſic, for *se piace*, at diſcretion.

Ad Ludos, in antiquity, a Roman ſentence, whereby criminals were condemned to entertain that barbarous people, either by fighting with beaſts, or with each other, and thus executing juſtice on themſelves.

Ad Metalla, in antiquity, the puniſhment of being doomed to work in the mines. Criminals condemned to this, among the Romans, were called *metallici*. It were to be wiſhed that puniſhment of this kind could be ſubſtituted in lieu of our frequent executions; which are as repugnant to the principle of humanity as thoſe of ſound policy.

Ad Quiddities, among ſchoolmen, include the relations, analogies, agreements, diſagreements, ſimilitudes, and diſſimilitudes of things. Ad quiddities are properly thoſe attributes of things, which anſwer to the queſtion, *ad quid?* to what? By which they differ from mere *quiddities*, which anſwer to the queſtion, *quid sit?* what is it? The latter enquire what things are in themſelves; the former what they are, *ad alia*, in their conſequences.

Ad Valorem, is uſed in ſpeaking of the duties, or cuſtoms, paid for certain commodities: ſome things are rated by the weight, meaſure, tale, or the like; others pay *ad valorem*, according to the value or worth, ſworn to by the owner.

ADAGE, a maxim handed down from antiquity; a proverb.

ADAGES, collections of, have been made by different learned men. Eraſmus made a large and valuable collection of the Greek and Roman adages: Mr. Ray, of the Engliſh: Mr. Kelly, of the Scotch proverbs, and the great Dr. Franklin, in his almanac entitled "Poor Richard," has introduced thoſe moſt commonly uſed in America. This collection has been ſo highly eſteemed, that it has been tranſlated into moſt European languages.

ADAGIO, a term uſed by muſicians, to mark a ſlow time.

ADAL, in medicine, according to Paracelſus, ſignifies that part of plants, in which their medicinal virtue conſiſts; of the pure and active parts of plants, ſeparate from the impure and inert.

ADALIDES, in the Spaniſh policy, officers of juſtice, in military matters. In the laws of king Alphonſus, they are ſpoken of as officers appointed to direct the marching of the forces in time of war. Lopez repreſents them as a ſort of judges, who take cognizance of the differences ariſing upon excurſions, the diſtribution of plunder, &c.

ADAM. This name was divinely impoſed on both the original parents of the human race, to import their earthly original, their comelineſs, and affectionate conjunction; but it is ordinarily appropriated to the man. On the ſixth day of the creation, when God had fitted the earth for his reſidence, he formed man's body of the duſt of the ground: he breathed into his noſtrils the breath of life, and endued him with a rational ſoul, reſembling him in knowledge, righteouſneſs, and holineſs: for his exerciſe and refreſhment he placed him in the garden of Eden, to keep and cultivate it. Though his moſt perfect obedience was due to his Maker, and could properly merit no valuable reward, God, in rich condeſcenſion and grace, made a covenant with him, importing, that, upon condition of his perfect obedience to every precept of the divine law, he and all his poſterity ſhould be rewarded with happineſs and life, natural, ſpiritual, and eternal; but, in caſe of failure, ſhould be ſubjected to the contrary, death; to which he conſented. This, to be ſure, was the ſhorteſt, eaſieſt, and moſt probable method of ſecuring happineſs to mankind. Adam too was the fitteſt perſon, and lay under the ſtrongeſt obligations to perform the condition. To render him the more attentive; to keep him mindful of his fallible nature, and that his happineſs conſiſted only in the enjoyment of God; to try his obedience in the eaſieſt point of indifference, he was prohibited, under pain of immediate death, to eat of the fruit of a certain *tree*.

The ſame day, God conſtituted him lord of the fiſh, fowls, cattle, and creeping things, vegetables, and other things on the earth: the fowls, cattle, and creeping things, he convened before Adam, as his vaſſals; and Adam marked his wiſdom and authority, in aſſigning to each its proper name. None of theſe animals being a fit companion for Adam, God caſt him into a deep ſleep, took a piece of fleſh or a rib from his ſide, without the leaſt pain, and formed it into the body of a moſt beautiful woman: Her too he endued with a reaſonable ſoul, and brought her to Adam, who received her with the utmoſt affection, as his wife. There being no inclemency in the air, no irregularity in their nature, they went both naked, and were neither hurt nor aſhamed. That very day, or rather ſoon after, Satan, juſt expelled from the heavenly abodes, conceiving the ſtrongeſt envy at the happineſs of mankind, reſolved to effectuate their ruin. Sticking at nothing baſe, he entered into a ſerpent, the moſt ſimple or ſubtle of the animal tribe. Thence, finding the woman all alone, he conferred with her; tempted her to ſuſpect the meaning and certainty of the divine prohibition, and to eat of the forbidden fruit. Solicited by her, Adam followed his wife's example, received part of the fruit from her hand, and did eat thereof. He no doubt hoped for happineſs, at leaſt impunity, in ſo doing: but it is quite abſurd to imagine, that he willingly threw himſelf into endleſs woe from affection to her. Guilt immediately ſeized on their conſcience, and irregular paſſions awakened in their ſoul, they were aſhamed of their nakedneſs, and applied fig-leaves for a covering. In the cool, or afternoon of the day, they heard the Voice, the Word, or Son of God, walking in the garden, and fled to hide themſelves amidſt the thick buſhes or trees. God called for Adam, and inquired why he fled, how he became aſhamed of his nakedneſs, and why he had eaten the forbidden fruit? Adam laid the whole blame on Eve, whom, he ſaid, God had given him for an aſſiſtant and comfort. Eve blamed the ſerpent as her deceiver. After paſſing a ſentence of ruin upon Satan and his agents, by means of the ſeed of the woman; and of affliction on the ſerpent, the inſtrument of his deceit; of ſorrow, painful child-birth, and further ſubjection to her huſband, on the woman and her female offspring, God threatened Adam and his whole poſterity with a curſe on their fields, with ſcanty crops, with ſorrow and toil, and finally, with death, and a return to duſt.

The threatening on Satan implied a promiſe of mercy and redemption to mankind, by the blood of God's Son: God therefore now inſtructed Adam and his wife in the manner and ſignification of typical ſacrifices. To mark their degrading of themſelves to the rank of beaſts by ſin, and denote their recovery by the imputed righteouſneſs of the great atonement, God clothed them with the ſkins of ſacrificed animals. To teſtify his diſpleaſure with ſin, and prevent their vain attempts to procure happineſs and immortality by eating of the tree of life, God expelled them from Eden, to cultivate the fields eaſtward, whence their body had been formed. The ſymbols of the divine preſence hovered on the eaſt of the garden; ſome angels, and perhaps ſome fiery meteor there placed, rendered it impoſſible for mankind to re-enter. Juſt before his expulſion, Adam had called his wife Eve, becauſe ſhe was to be the common mother of men, particularly of thoſe appointed to everlaſting life. Now he knew her, and ſhe conceived and bare Cain, and ſoon after Abel. Theſe Adam taught to ſacrifice to the Lord: but both in the iſſue proved to their parents a ſource of trouble and grief. Soon after the death of Abel, Adam, in the 130th year of his age, had Seth born to him: he had beſides a great many other children. After he had lived 930 years, he died. A number of fancies concerning him, are reported by heathen and Jewiſh writers: but he is repreſented in ſcripture as a covenant-breaker; as a coverer of his tranſgreſſions; as a ſource of guilt and death to all his poſterity; and as a figure of the promiſed Meſſiah.

ADAMANT, 1. A ſtone, imagined by writers, of impenetrable hardneſs.—2. The diamond.—3. The adamant is taken for the loadſtone.

ADAMANTEAN, hard as adamant.

ADAMANTINE, 1. Made of adament.—2. Having the qualities of adamant; as, hardneſs, indiſſolubility.

ADAMAS, in aſtrology, a name given to the moon.

Adamas, in natural hiſtory, the ſpume or ſcoria of gold; which is caſt away, as not being maleable. This is particularly called *cbrusou adamanta*, and is miſtaken by Pliny for a gem of that name.

Adamas lucidus, a name given by Mr. Boyle, to a diamond, which he had in his poſſeſſion, that ſhined in the dark; a property ſince diſcovered in ſome others, at leaſt when excited by friction.

ADAMIC Earth, a name given to common red clay, alluding to that ſpecies of earth of which the firſt man is ſuppoſed to have been made.

ADAMI Pomum, in anatomy, a protuberance in the fore-part of the throat, formed by the os hyoides. It is thought to be ſo called upon a ſtrange conceit, that a piece of the forbidden apple, which Adam eat, ſtuck by the way and occaſioned it.

ADAMITÆ, Adamites, in eccleſiaſtical hiſtory, the name of a ſect of ancient heretics, that ſprung up about the end of the 2d century, ſuppoſed to have been a branch of the Baſilidians and Carpocratians. Epiphanius tells us, that they were called Adamites from their pretending to be re-eſtabliſhed in the ſtate of innocence, ſuch as Adam was at the moment of his creation, whence they ought to imitate him in going naked. They deteſted marriage, maintaining that the conjugal union would never have taken place upon earth had ſin been unknown. This obſcure and ridiculous ſect did not at firſt laſt long ; but it was revived, with additional abſurdities, in the 12th century, by one Tandamus, ſince known by the name of Tanchelin, who propagated his errors at Antwerp, in the reign of the emperor Henry V. He maintained, that there ought to be no diſtinction between prieſts and laymen, and that fornication and adultery were meritorious actions. Tanchelin had a great number of followers, and was conſtantly attended by 3000 of theſe profligates in arms. His ſect did not, however, continue long after his death: but another appeared under the name of Turlupins, in Savoy and Dauphiny, where they committed the moſt brutal actions in open day. About the beginning of the 15th century, one Picard, a native of Flanders, ſpread theſe errors in Germany and Bohemia, particularly in the army of the famous Ziſca, nothwithſtanding the ſevere diſcipline he maintained. Picard pretended that he was ſent into the world as a new Adam, to re-eſtabliſh the law of nature ; which, according to him, conſiſted in concealing no part of the body, and having all the women in common. The ſect found alſo ſome partizans in Poland, Holland, and England.

ADAMITES, in church hiſtory, a name given by ſome writers to the firſt patriarchs, the ſons or deſcendants of Adam by Seth. In which ſenſe *Adamites* amount to the ſame with *Sethites*, and ſtand diſtinguiſhed from *Cainites*. There are divers traditions concerning the quarrels, wars, &c. between the *Adamites* and the *Cainites*.

ADAMATISM, the opinions and practices of the Adamites. Beauſore has ſhewn, that the *Adamitiſm*, i. e. the nakedneſs of theſe people is a mere calumny, forged by their adverſaries, the Calixanites and Papiſts, at the time when the Vandois firſt appeared in that country. Jovet and Moreri ſpeak of *Adamites* in England ; and indeed the Romaniſts and Reformed mutually reproach each other with having *Adamites* among them.

ADAMITUM and ADAMITA, the hardeſt white ſtones, and ſtones in the bladder. The former, Paracelſus ſays, are a ſpecies of tartar.

ADAMS, a townſhip in Berkſhire, Maſſachuſetts, about 140 miles to the N. W. of Boſton, and containing upwards of 2000 inhabitants. In the northern part of this townſhip is a great natural curioſity. A mill ſtream, called Hudſon's Brook, which riſes in Vermont and falls into the north branch of Hooſock river, has for about 40 rods, formed a channel, which, in ſome places is 60 or 70 feet deep, through a quarry of white marble. Over the deepeſt part of this channel, ſome of the rocks remain, and form a natural bridge. The length of this bridge is about 14 or 15 feet, its breadth is about 10, and its height above the water at the top is 62 feet. Partly under this bridge, and about 10 or 12 feet below it is another, which is as wide but not ſo long, for at the eaſt end they form one body of rock 12 or 14 feet thick, and under this the water flows. The rocks here are commly white ; but in ſome places clouded, like the coarſe marble which is found in great quantities at Lameſbourgh and other places in Berkſhire county.

ADAM'S APPLE, in anatomy, a prominent part of the throat.

ADAM's APPLE, in botany, a kind of fruit frequent in Italy, reſembling a lemon, ſaid to be a good remedy againſt the itch. See CRITUS.

ADAM's BRIDGE, a reef of rocks, which runs between Ceylon and the continent. See ADAM's PEAK.

ADAM's NEEDLE. See YUCCA.

ADAM's PEAK, or PIKE, a high mountain of the Eaſt Indies, in the Iſland of Ceylon, on the top of which, tradition ſays, Adam was created ; and near it a reef of rocks which run over to the continent, called *Adam's Bridge*, which is ſaid to have been made by angels to carry him over to the main land. Theſe, however, are European names and traditions, as the natives do not call the firſt man Adam.

ADAMSTOWN, a ſmall town in Doncaſter county, Pennſylvania, about 20 miles N. E. from Lancaſter.

ADAMUS, in alchemy, the philoſopher's ſtone. Alchemiſts ſay, it is an animal, and that it has carried its inviſible Eve in its body, ſince the moment they were united by the Creator.

ADANA, an ancient and agreeable town of Aſia, in Natolia, in the province of Carmania. It is ſeated on the river Chequen ; on the banks of which ſtand a ſtrong little caſtle, built on a rock. It has a great number of beautiful fountains brought from the river by means of water-works. Over the river there is a ſtately bridge of 15 arches, which leads to the water-works. The climate is very pleaſant and healthy, and the winter mild and ſerene : but the ſummer is ſo hot as to oblige the principal inhabitants to retire into the neighbouring mountains, where they ſpend ſix months among ſhady trees and grottos, in a moſt delicious manner. The adjacent country is rich and fertile, and produces melons, cucumbers, pomegranates, pulſe and herbs of all ſorts, all the year round ; beſides corn, wine, and fruits in their proper ſeaſons. It is 25 miles N. E. of Tarſus, on the road to Aleppo. Long. 111. 12. E. Lat. 37. 26. N.

ADANSONIA, ETHIOPIAN SOUR-GOURD, MONKIES-BREAD, or AFRICAN CALABASH-TREE, a genus of the monodelphia order, belonging to the polyandria claſs of plants ; the characters of which are : The calyx is a perianthium one-leaved, half five cleft, cup-form, (the diviſions revolute,) deciduous : The corolla conſiſts of five petals, roundiſh, nerved, revolute, growing reciprocally with the claws and ſtamina : The Lamina have numerous filaments, coaleſced beneath into a tube, and crowning it, expanding horizontally ; the antheræ kidney-form, incumbent : The piſtillum has an egged germ ; the ſtylus very long, tubular, variouſly intorted ; the ſtigmata numerous (10) priſmatic, villous, ray-expanded : The pericarpium is an oval capſule, woody, not gaping, 10-celled, with farinaceous pulp, the partitions membraneous : The ſeeds are numerous, kidney-ſhaped, rather bony, and involved in a friable pulp. There is at preſent but one known ſpecies belonging to this genus, the BAOBAD, which is perhaps the largeſt production of the whole vegetable kingdom. It is a native of Africa. The trunk is not above 12 or 15 feet high, but from 65 to 78 feet round. The loweſt branches extend almoſt horizontally; and as they are about 60 feet in length, their own weight bends their extremities to the ground, and thus form an hemiſpherical maſs of verdure of about 120 or 130 feet diameter. The roots extend as far as the branches; that in the middle forms a pivot, which penetrates a great way into the earth; the reſt ſpread near the ſurface. The flowers are in proportion to the ſize of the tree: and are followed by an oblong fruit, pointed at both ends, about 10 inches long, 5 or 6 broad, and covered with a kind of greeniſh down, under which is a ligenous rind, hard and almoſt black, marked with rays which divide it lengthwiſe into ſides. The fruit hangs to a tree by a pedicle two feet long, and an inch diameter. It contains a whitiſh ſpongy juicy ſubſtance; with ſeeds of a brown colour, and ſhaped like a kidney-bean. The bark of this tree is nearly an inch thick, of an aſh-coloured grey, greaſy to the touch, bright, and very ſmooth: the outſide is covered with a kind of varniſh; and the inſide is green, ſpeckled with red. The wood is white and very ſoft; the firſt ſhoots of the year are green and downy. The leaves of the young plants are entire, of an oblong form, about 4 or 5 inches long, and almoſt 3 broad towards the top, having ſeveral veins running from the middle rib; they are of a lucid green colour. As the plants advance in height, the leaves alter, and are divided into 3 parts, and afterwards into 5 lobes, which ſpread out in the ſhape of an hand. The tree ſheds its leaves in November, and new ones begin to appear in June. It flowers in July, and the fruit ripens in October and November. It is very common in Senegal, and the Cape de Verd iſlands; and is found 100 leagues up the country at Gulam, and upon the ſea coaſt as far as Sierra-leona.—The age of this tree is perhaps no leſs remarkable than its enormous ſize. Mr. Adanſon relates, that, in 1749, in a botanical excurſion to the Magdalene iſlands, in the neighbourhood of Goree, he diſcovered ſome calabaſh-trees, from 5 to 6 feet diameter, on the bark of which were engraved or cut to a conſiderable depth a number of European names. Two of theſe names, which he was at the trouble to repair, were dated, one the 14th, the other the 15th century. The letters were about ſix inches long, but in breadth they occupied a very ſmall part only of the circumference of the trunk: from whence he concluded, they had not been cut when theſe trees were young. Theſe inſcriptions, however, he thinks ſufficient to determine pretty nearly the age which theſe calabaſh-trees may attain; for even ſuppoſing that thoſe in queſtion were cut in their early years, and that trees grew to the diameter of 6 feet in 2 centuries, as the engraved letters evince, how many centuries muſt be requiſite to give them a diameter of 25 feet, which is perhaps not the laſt term of their growth! The inſcribed trees mentioned by this ingenious Frenchman had been ſeen in 1555 almoſt 2 centuries before, by Thevet, who mentions them in the relation of his voyage to Terra Antarctica, or Auſtralis.

Adansonia, the culture of.—This tree is propagated from ſeeds, which are brough from the countries where they grow naturally. Being natives only of hot climates, the plants will not thrive in the open air in Britain, even in ſummer. The ſeeds are therefore to be ſown in pots, and blunged into a hot-bed, where the plants will appear in about ſix weeks, and in a ſhort time after be fit to tranſplant. They muſt then be planted either in a ſeparate pot, in light ſandy earth, and plunged into a hot-bed, ſhading them till they have taken root: after which they ſhould have freſh air admitted every day in warm weather: but muſt be ſparingly watered, as being apt to rot. They grow quickly for 2 or 3 years, but afterwards made little progreſs; the lower part of the ſtem that begins to ſwell, and put out lateral branches, inclining to a horizontal poſition, and covered with a light grey bark.—Some of this kind of plants were raiſed from ſeeds obtained from Grand Cairo by Dr. William Sherard, in 1724, and were grown to the height of 18 feet; but were all deſtroyed by the ſevere froſt in 1740; after which they were unknown in Britain till the return of Mr. Adanſon to Paris, in 1754.

Adansonia, the virtues of.—The virtues and uſes of this tree and its fruit are various. The Negroes of Senegal dry the bark and leaves in the ſhaded air, and then reduce them to powder, which is of a pretty good green colour. This powder they preſerve in bags of linen or cotton, and call it *lillo*. They uſe it every day, putting two or three pinches of it into a meſs, whatever it happens to be, as we do pepper and ſalt: but their view is, not to give a reliſh to their food, but to preſerve a perpetual and plentiful perſpiration, and to attemper the too great heat of the blood; purpoſes which it certainly anſwers, as ſeveral Europeans having proved by repeated experiments, preſerving themſelves from the epidemic fever, which in that country deſtroys Europeans like the plague, and generally rages during the months of September and October, when, the rains having ſuddenly ceaſed, the ſun exhales the water left by them upon the ground, and fills the air with a noxious vapour.

M. Adanſon, in that critical ſeaſon, made a light ptiſan of the leaves of the boabab, which he had gathered in the Auguſt of the preceding year, and had dried in the ſhade; and drank conſtantly about a pint of it every morning, either before or after breakfaſt, and the ſame quantity of it every evening after the heat of the ſun began to abate; he alſo ſometimes took the ſame quantity in the middle of the day, but this was only when he felt ſome ſymptoms of an approaching fever. By this precaution he preſerved himſelf, during the five years he reſided at Senegal, from the diarrhœa and fever, which are ſo fatal there, and which are, however, the only dangerous diſeaſes of the place; and other officers ſuffered very ſeverely, only one excepted, upon whom Mr. Adanſon prevailed to uſe this remedy, which for its ſimplicity was deſpiſed by the reſt. This ptiſan alone alſo prevents that heat of urine which is common in theſe parts, from the month of July to November, provided the perſon abſtains from wine.—The fruit is not leſs uſeful than the leaves and the bark. The pulp that envelopes the ſeeds has an agreeable acid ſtate, and is eaten for pleaſure: it is alſo dried and powdered, and thus uſed medicinally in peſtilential fevers, the dyſentery, and bloody flux; the doſe is a drachm, paſſed through a fine ſieve, taken either in common water, or in an infuſion of the plantain. This powder is brought into Europe under the name of *terra sigillata lemnia*. The woody bark of the fruit, and the fruit itſelf when ſpoiled, helps to ſupply the negroes with an excellent ſoap, which they make by drawing a ley from the aſhes, and boiling it with palm-oil that begins to be rancid. The trunks of ſuch of theſe trees as are decayed, the negroes hollow out into burying places for their poets, muſicians, buffons: perſons of theſe characters they eſteem greatly while they live, ſuppoſing them to derive their ſuperior talents, from ſorcery or a commerce with demons; but they regard their bodies with a kind of horror when dead, and will not give them burial in the uſual manner, neither ſuffering them to be put into the ground, nor thrown into the ſea or any river, becauſe they imagine that the water would not then nouriſh the fiſh, nor the earth produce its fruits. The bodies ſhut up in theſe trunks become perfectly dry without rotting, and form a kind of mummies, without the help of embalment.—The boabob is very diſtinct from the calabaſh tree of America, with which it has been confounded by father Labat. See Crescentia.

To ADAPT, *v. a.* To fit one thing to another; to ſuit; to proportion.

ADAPTATION, *n. s.* The act of fitting one thing to another; the fitneſs of one thing to another.

ADAPTERS, or Adopters. See Chemistry.

ADAPTION, *n. s.* The act of fitting.

ADAR, the name of a Hebrew month, anſwering to the end of February, and beginning of March, the 12th of their ſacred, and 6th of their civil year. On the 7th day of it, the Jews kept a feaſt for the death of Moſes; on the 13th, they have the feaſt of Eſther: and on the 14th, they celebrate the feaſt of Purim, for their deliverance from Haman's conſpiracy.

ADARCE, in the materia medica of the ancients, a ſaltiſh humour concreting about the ſtalks of reeds, and other vegetable matter, in form of incruſtations. It was chiefly produced in Cappadocia and Galatia, though we alſo read of it in Italy; and of a native kind produced in Indian reeds, as ſugar in the cane. Its colour is like that of the fine powder of the Aſſian ſtone, or *sarcophagus*, and its ſubſtance porous like the baſtard ſponge. It is a topic to rub the ſkin in leproſy, ſun-burning, tetters, freckles, and ſuch like blemiſhes, being on the whole of an acrimonious quality.

ADARCON, Adarconium, an ancient coin mentioned in Scripture, uſually of gold, derived, as ſome think, from thoſe gold pieces coined by Darius, called *dareichoi*. It was worth about 3 dols. and 33 cts. Hoſtus makes the adarcon only equal to the Attic drachma; but biſhop Cumberland, after Ariſtophanes and Harpocration, twice as much.

ADARIDGE, or adariges, in chemiſtry, ſal ammoniac.

ADARME, in commerce, a ſmall weight in Spain, which is alſo uſed at Buenos-Ayres, and in all Spaniſh America. It is the 16th part of an ounce, which at Paris is called the *demi-gros*. But the Spaniſh ounce, is ſeven *per cent.* lighter than that of Paris. Stephens renders it in Engliſh by a dram.

ADARNECH, *n. s.* orpiment.

ADARTICULATION, is uſed by ſome phyſicians, for *arthrodia*, by others, for *diarthroſis*. See Arthrodia, and Diarthrosis.

ADATIAS, Adatsi, or Adatys, in commerce, a muſlin or cotton cloth, very fine and clear, of which the piece is ten French ells long, and three quarters broad. It comes from the Eaſt Indies; and the fineſt is made at Bengal,

ADCHER, in the materia medica, a name given by Avicenna and Serapion to the Scænanth, or camel's hay. This ſeems to have been, at that time, the common Arabian name of this drug; but Garcias tells us, that in his time the Arabs called it *adher*. The Arabians, however, have not confined this word to the Scænanth, but expreſs by it all kinds of ruſhes. Avicenna tells us the *adher* is of two kinds; the one bearing no fruit, the other bearing a hard black fruit; this plainly belongs not to Scænanth, but the common ruſh, of which Dioſcorides has, in the ſame manner, deſcribed 2 kinds, thus differing from one another.

To ADD, *v. a.* 1. To join ſomething to that which was before.—2. To perform the mental operation of adding one number or conception to another.

ADDA, in geography, a river of Switzerland and Italy which riſes, in mount Braulio, in the country of the Griſons and, paſſing through the Valteline, traverſes the lake Como, and the Milaneſe, and falls into the Po, near Cremona

ADDABLE, *adj.* that to which ſomething may be added. See Addible.

ADDACE, in natural hiſtory, the name by which the Africans call the common antelope. See Gazella.

To ADDECIMATE, *v. a.* To take or aſcertain tithes.

ADDEPHAGIA, in medicine, a term uſed by ſome phyſicians, to denote a greedineſs in children, whereby they over-load themſelves with food. Some uſe *addephagia* in a more extenſive ſenſe, for voraciouſneſs in general.

ADDER, *n. s.* A ſerpent, a viper, a poiſonous reptile; perhaps of any ſpecies. In common language, adders and ſnakes are not the ſame.

ADDEXTRATORES, in the court of Rome, the pope's mitre-bearers, ſo called, according to Ducange, becauſe they walk at the pope's right-hand when he rides to viſit the churches.

ADDICE, or Adze, a kind of crooked ax uſed by ſhipwrights, carpenters, coopers, &c.

ADDICTI, in antiquity, a kind of ſlaves, among the Romans, adjudged to ſerve ſome creditor whom they could not otherwiſe ſatisfy, and whoſe ſlaves they became till they could pay or work out the debt.

ADDICTION, among the Romans, was making over goods to another, either by ſale, or by legal ſentence; the goods ſo delivered were called *bona addicta*. Debtors were ſometimes delivered over in the ſame manner; and thence called *ſervi addicti*.

ADDICTIO in diem, among the Romans, the adjudging a thing to a perſon for a certain price, unleſs by ſuch a day the owner, or ſome other, gave more for it.

ADDISON County, in the ſtate of Vermont, lies on the eaſt ſide of lake Champlain, and is about 30 miles long, and 27 broad. It contains about 7000 inhabitants, and is divided into 21 townſhips, the capital of which is Middlebury. This county is nearly divided into equal parts by the Otter Creek and lies between Chittenden and Rutland counties, the former of which is on the north and the latter on the ſouth ſide of it. That range of mountains, which, from their remarkable verdure, are called the Green Mountains by the Engliſh, and *Ver Mons* by the French, from which laſt the ſtate takes its name, paſſes through this county, which is likewiſe remarkable for the manufactory of iron, 4 forges having been erected here in 1792.

Addison, a poſt town in the above county, containing upwards of 400 inhabitants, was laid out by the legiſlature of the ſtate, in the year 1761. It is ſituated on the lake Champlain, and on the eaſt is ſeparated from the townſhip of New-Haven by Otter Creek. This townſhip is 591 m. almoſt due north from the city of Waſhington, and the Snake mountain lies partly to the S. E. ſide of it

Addison, Joseph, ſon of the Rev. Dr. Addiſon, rector of Milſton, Wiltſhire, England, was born May 1, 1672. He received his education at the univerſity of Oxford, where he was eminently diſtinguiſhed for improvement in literature and amiability of manners, and in February, 1693, took his maſter's degree. In 1695 he wrote a poem to king William; and in 1697 appeared his poem On the Peace of Ryſwick, which has been declared by ſome good judges "to be the beſt Latin poem ſince the Æneid" Having yet no public employment, he obtained, in 1699, a penſion of 1332 dollars, that he might be enabled to travel. Upon this he ſet out to the continent, where he reſided ſome years, chiefly in Italy; and, on his return, publiſhed an account of his travels, which was greatly eſteemed.

The victory of Blenheim, in 1704, was ſoon after celebrated by Mr. Addiſon in a poem, which not only added greatly to his celebrity, but introduced him to the poſt of Commiſſioner of Appeals; ſoon after which he was made Under Secretary of State, and when the Marquis of Wharton was appointed Lord Lieutenant of Ireland, Addiſon accompanied him as Secretary. In 1709 Steele began his Tatler, many of the beſt papers of which were written by our author. To the Tattler ſucceeded the Spectator, the value of which publication is perhaps as univerſally acknowledged, as any thing of the kind ever written, and to this our author was the principal contributor. In 1713, he wrote the celebrated tragedy of Cato. He was alſo the author of the Drummer, or Haunted Houſe, and of many political pieces ſuited to the exiſting ſtate of public affairs; in all of which a ſacred regard to the liberties of the people is the moſt prominent character.

On Auguſt 2, 1716, he married the counteſs dowager of Warwick, to whom he is ſaid to have been firſt known by becoming tutor to her ſon. This marriage, however, made no addition to his happineſs, as it neither found them nor made them equal. She always remembered her own rank, and thought herſelf entitled to treat with very little ceremony the former tutor of her ſon. In 1717 he was made Secretary of State, but notwithſtanding his great talents, it was univerſally acknowledged, that he was incompetent to the duties of his place. In the houſe of commons he could not ſpeak, and was therefore uſeleſs to the defence of government. In the office he could not iſſue an order without loſing his time in queſt of fine expreſſions. At laſt finding by experience his own inability, he was forced to ſolicit his diſmiſſion, which he obtained with a penſion of 6660 dollars. He now engaged in a laudable and excellent work, viz. A Defence of the Chriſtian Religion, which was publiſhed after his death.

Addiſon had, for ſome time, been oppreſſed with ſhortneſs of breath, which was now aggravated by a dropſy; and finding his danger very imminent, he prepared to die conformably to his own precepts and profeſſions. Lord Warwick, the ſon of his wife, was a young man of a very irregular life and looſe opinions. Addiſon had very aſſiduouſly endeavoured to reclaim him; but his arguments had heretofore been ineffectual: one experiment, however, remained to be tried. When he found himſelf near his laſt, he ſent for the young Lord; and when he deſired with tenderneſs, to hear his laſt injunctions, told him, "I have ſent for you to ſee how a Chriſtian can die," and almoſt immediately after expired without a ſtruggle. June 17, 1719.

ADDITAMENT, *n. s.* the addition, or thing added.

ADDITAMENTS, in chemiſtry, and pharmacy, ingredients added to medicines already compounded.

ADDITION, *n. s.* 1. The act of adding one thing to another; oppoſed to diminution.—2. Additament, or the thing added.—3. In Arithmetic. *Addition* is the reduction of two or more numbers of like kind together into one ſum or total.—4. In law, a title given to a man over and above his chriſtian name and ſurname, ſhewing his eſtate, degree, occupation, trade, age, place of dwelling, &c.

Addition, in algebra. See **Algebra**.

Addition, character of, is +, which we uſually expreſs by *plus*. Thus 3+4 denotes the ſum of 3 and 4; and is read 3 *plus* 4. See **Arithmetic**.

Addition, in muſic, a dot marked on the right ſide of a note, ſignifying that it is to be ſounded or lengthened half as much as it would have been without ſuch a mark.

Addition of decimals, fractions, whole numbers, &c. See **Arithmetic**.

Additions, in diſtilling, ſuch things as are added to the waſh, or liquor, while in a ſtate of fermentation, in order to improve the vinoſity of the ſpirit, procure a large quantity of it, or give it a particular flavour. All things, of whatever kind, thus added in the time of fermentation, are called by thoſe of the buſineſs who ſpeak moſt intelligently, *additions;* but many confound them with things of a different nature, under the name of *ferments*. See **Distilling**.

ADDITIONAL, *adj.* that which is added.

ADDITIVE, ſomething to be added to another. *Additive Ratio*, is uſed in geometry, for that whoſe terms are diſpoſed to addition, that is, to compoſition, in oppoſition to ſubtractive ratio, whoſe terms are diſpoſed to ſubtraction, i. e. to diviſion.

Additive Equations, in aſtronomy, thoſe which are to be added to the ſun's mean anomaly, in order to find the true one.

ADDITORY, *adj.* that which has the power or quality of adding.

ADDLE, *adj.* originally applied to eggs, and ſignifying ſuch as produce nothing, but grow rotten under the hen; thence transferred to brains that produce nothing.

Addle-headed, ſilly, ſtupid; drunken.

To **Addle**, *v. a.* to make addle; to corrupt; to make barren.

Addle-pated, *adj.* having barren brains.

To ADDRESS, *v. a.* 1. To prepare one's ſelf to enter upon any action.—2. To get ready; to put in a ſtate for immediate uſe.—3. To apply to another by words or forms of conſtruction.

Address, *n. s.* 1. Verbal application to any one, by way of perſuaſion; petition.—2. Courtſhip; Addreſs means alſo a diſcourſe preſented in the name of a conſiderable body of people, to expreſs or notify their ſentiments of joy, ſatisfaction, or the like, on ſome extraordinary occaſion.

Addreſſes were firſt ſet on foot by Oliver Cromwell. At Paris, their office of intelligence under the monarchy was called *bureau d'addresses*.

Address, in manners, is applied to the eaſe and propriety of a perſon's conduct in refined ſociety. It is alſo applied to ſuperiority of ability in matters of negociation civil and political; he, who diſplays the greateſt readineſs, collection, and ſkill, in treating and executing matters of negociation, is ſaid to be a perſon of addreſs. The French are ſaid to ſurpaſs all others in theſe two deſcriptions of *address*, manners and negociation. It is alſo uſed to ſignify the direction to, or reſidence of a perſon on the ſuperſcription of letters.

ADDRESSER, *n. s.* the perſon who addreſſes or petitions.

ADDUCENT, *adj.* a word applied to thoſe muſcles that bring forward, cloſe or draw together the parts of the body to which they are annexed.

ADDUCTION, in anatomy, the motion, or action of the adducent muſcles.

ADDUCTOR brachii, ſerves to draw the arm toward the trunk of the body; though Winſlow finds its office more complicated, and that it acts in concurrence with the flexors and extenſors, in bending and extending the arm.

Adductor indicis, is the muſcle of the fore-finger ariſing from the inſide of the bone of the thumb, and inſerted into the firſt bone of the fore-finger, which it draws towards the thumb.

Adductor minimi digiti pedis; the ſame as tranſverſalis pedis.

Adductor oculi, a muſcle of the eye, ſo called becauſe it inclines its pupil towards the noſe. It is alſo called *bibitorius;* becauſe it directs the eye toward the cup in drinking.

Adductor pollicis pedis, called alſo *antithenar*, is a muſcle of the great toe, which ariſes from the inferior part of the os cuneiforme tertium, and is inſerted into the external part of the oſſa ſeſſamoidea of the great toe which it draws nearer the reſt.

Aductor prostatæ, a name given by Santorini to a muſcle, which he alſo calls lavator proſtratus; and which Winſlow calls, proſtraticus ſuperior. Albinus, from its office, has very properly called it, compreſſor proſtratæ.

ADEB, in commerce, the name of a large Egyptian weight, uſed principally for rice, and conſiſting of 210 okes each of three rotolos, a weight two drams leſs than the Engliſh pound. But this is no certain weight; for at Roſetto the adeb is only 150 okes.

ADECTOS, a medicine that allays the ſenſe of pain, or the uneaſineſs created by ſtimulants.

ADEL, a kingdom on the eaſtern coaſts of Africa, which reaches as far as the ſtraights of Babelmandel, which unite the Red Sea to the ſea of Arabia. This country produces corn, and feeds a great number of cattle. The inhabitants carry on a trade in gold, ſilver, ivory, oil, frankincenſe, a ſort of pepper, and other merchandizes of Arabia and the Indies. The king was formerly a vaſſal to the grand negus of Abyſſinia; but being Mahometans, and the Abyſſinians a ſort of Chriſtians, they could not agree; and in 1535 came to an open rupture, when the Adelians threw off the yoke, ſeeking protection from the Grand Signior. The principal places are, Adela, ſeated in the centre of the country, and is the town where the king reſides: Zeila, near the Arabian Sea, is a rich town, and has a good trade: Barbora, near the ſea-coaſt, is an ancient trading town. It rains very ſeldom in this country.

Adel, in Ichthyology, the lavearetus, or albula nobilis. Theſe are generally treated of by authors as two different kinds of fiſh. But Artedi contends that they are the ſame ſpecies, and diſtinguiſhes them by the name of the coregenus, with the upper jaw flat, and longer than the under; and with fourteen rays in the back fin.

ADELA, a principal city in the kingdom of Adel, which ſee.

ADELANTADO, the deputy of a province.

ADELFOIS, a gold mine, in the pariſh of Alſheda, and diſtrict of Jonkioping, in the province of Smaland, Sweden. It was firſt diſcovered in 1738. Ducats are made of the gold.

ADELIA, a genus of the monadelphia order, belonging to the diœcia claſs of plants; the characters of which are: The male calyx is a perianthium one-leaved, three parted; the florets ſublanced and concave; no corolla: the ſtamina conſiſt of many capillary filaments the length of the calyx, conjoined on the baſe in a cylinder; the antheræ are roundiſh. The female calyx is a five-leaved perianthium; the leaflets ſublanced, concave perſiſtent; no corolla: The piſtillum has a roundiſh germen; the ſtyli are three, ſhort, and divaricated; the ſtigma lacerated: the perianthium is a three-grained, roundiſh, three-celled capſule: the ſeeds are ſolitary and roundiſh. In the natural method this genus belongs to the 38th order, Tricoccæ. Of this genus there are three ſpecies; the bernardia, the ricineella, and acidoton. They are natives of Jamaica, and are a-kin to the ricinus or croton, and may be propagated in hotbeds from ſeeds procured from Jamaica.

ADELIANS, the inhabitants of Adel, which ſee.

ADEMPTION, *n. s.* taking away; privation.

Ademption, in civil law, implies the revocation of a grant, donation or the like.

ADEN, formerly a rich and conſiderable town of Arabia Felix. It is ſeated on the ſea-ſide, a little eaſtward of the ſtraits of Babelmandel; but it has been ruined and abandoned for ſome years. Long. 121, 30 E. Lat. 13, 10 N.

Aden, in anatomy, a gland, glandule, or glandular ſwelling; a bubo.

ADENANTHERA, basted flower fence, a genus of the monogynia order, belonging to the decandria claſs of plants. In the natural method, it belongs to the 33d order, *Lomentaceæ*. The characters are: the calix is a perianthium conſiſting of one very ſmall five-toothed leaf. The corolla conſiſts of five bell-ſhaped lanceolate ſeſſible petals, convex within and concave under. The ſtamina have ten erect ſubulated filaments ſhorter than the corolla; the antheræ are roundiſh, incumbent, bearing a globular gland on the exterior top. The piſtillum has a long gibbous germen; the ſtylus ſubulated the length of the ſtamina; the ſtigma ſimple. The pericarpium is a long, compreſſed, membraneous legumen. The ſeeds are very numerous, roundiſh, and remote. Only one ſpecies of this plant is known in Britain: but there is a variety, with ſcarlet ſeeds, which, however, is rare, and grows very ſlowly. It is a native of India, and riſes a conſiderable height. It is as large as the tamarind tree; ſpreads its branches wide on every ſide, and makes a fine ſhade; for which reaſon, it is frequently planted by the inhabitants in their gardens or near their habitations. The leaves of this tree are double winged, the flowers of a yellow colour, and diſpoſed in a long bunch. Theſe are ſucceeded by long twiſted membraneous pods, incloſing ſeveral hard compreſſed ſeeds, of a beautiful ſcarlet, or ſhining, black colour. This plant muſt be raiſed in a hot-bed, and kept during winter in a ſtove.

ADENBURG, or Aldenburg, a town of Weſtphalia, and in the duchy of Berg ſubject to the Elector Palatine. It is 12 miles N. E. of Cologne, and 17 W. of Bonn. Long. 82. 16. E. Lat. 51. 2. N.

ADENOGRAPHY, *n. s.* a treatiſe of the glands. See Anatomy.

ADENOIDES, glandulous, or of a glandular form; an epithet applied to the prostatæ.

ADENOLOGY, the ſame with Adenography.

ADENOS, a kind of cotton, otherwiſe called marine cotton. It comes from Aleppo by the way of Marſeilles, where it pays 20 *per cent.* duty.

ADENOSUS Abscessus, in medicine, a crude hard tubercle proceeding from obſtructions, difficult of diſcuſſion, and reſembling the appearance of a gland.

ADEONA, in mythology, a goddeſs invoked by the Romans when they ſet out upon a journey.

ADEPHAGIA, in mythology, the goddeſs of gluttony, to whom the Sicilians paid religious worſhip.

ADEPS, in anatomy, fat; an animal oil, ſecreted from the blood, and contained in the membrana adipoſa, or, as Boerhaave calls it, the membrana celluloſa; which is a congeries of a great number of membraneous laminæ, joined irregularly to each other at different diſtances, ſo as to form numerous interſtices of different capacities, which communicate with each other. Theſe cellular interſtices are ſo many little bags, filled with an oily juice, more or leſs liquid, the different conſiſtence of which depends chiefly on the ſize, extent, and ſubdiviſions of the cells. Newmann divides *fats*, from their conſiſtence, into three kinds; the firſt called *pinguedo*, is ſoft and thin; and is found in birds, reptiles, and fiſhes. The ſecond is thick, liquefies leſs readily, and is denominated *axungia*. The third is more hard and firm; when taken from the animal it is called *adeps*, and when freed from the ſkin, &c. *ſevum*. The two laſt kinds of *fat*, are chiefly found in quadrupeds. In the young *foetus*, there is ſcarce any fat; but in the older *foetus*, fat begins to appear. When the child is born, and for ſome years after, it hath much fat immediately beneath the ſkin; in men, the fat is moſt abundantly ſpread on the *glutei* muſcles. Fats taken freely as food are difficult of digeſtion, relax and weaken the tone of the ſtomach and inteſtines, and are ſuppoſed likewiſe to render the juices tenacious, and to increaſe the bile. The medical virtues of fats, as manifeſted by experience, are ſuch as ariſe from their uſe in external applications, for ſoftening and ſuppling, for abating pains and ſpaſms, and for promoting maturation. Thoſe that are principally uſed are the fat of *vipers, hogs lard* and *mutton ſuet*.

ADEPT, *n. s.* he who is completely ſkilled in all the ſecrets of his art. It is, in its original ſignification, appropriated to the chemiſts, but is now extended to other artiſts.

Adept. *adj.* ſkilful; thoroughly verſed.

ADEPTI, Adepts, from *adipisci*, to obtain; a denomination given to the proficients in *Alchemy*; particularly to thoſe who pretend to the ſecrets of the philoſopher's ſtone, and the univerſal medicine. Ripley, Lully, Paracelſus, Helmont, Hollandus, Sendivogius, &c. are the principal among the *adepti*. It is a ſort of tradition among the *Alchemists*, that there are always twelve *adepti*; and that their places are immediately ſupplied by others, whenever any of the fraternity die.

ADEPTION, *n. s.* getting.

ADEPTISTS. See Adepti.

ADEQUATE, *adj.* equal to; proportionate; correſpondent to, ſo as to bear an exact reſemblance of proportion. It is uſed generally in a figurative ſenſe, and often with the particle *to*.

Adequate, in logic, is applied to the objects of ſcience. The adequate object of a ſcience includes the material and formal object: the material object of a ſcience, is that part which is common to it with other ſciences: the formal is that which is peculiar to itſelf.

Adequate ideas or notions, in metaphyſics, are ſuch images or conceptions of an object, as perfectly repreſent it, or anſwer to all the parts or properties of it. M. Leibnits defines an adequate notion to be that of whoſe ſeveral characters we have diſtinct ideas.—Thus, a circle being defined a figure bounded by a curve line which returns into itſelf, and whoſe points are all equally diſtant from a certain intermediate point therein; our notion of a circle is adequate, if we have diſtinct ideas of all theſe circumſtances, viz. a curve returning upon itſelf, a middle point, an equality of diſtance, &c. All ſimple ides are adequate and perfect; and the faculty be what it will, that excites them, repreſents them entire. All abſtract ides are alſo adequate and perfect; ſince they repreſent all that part of the ſubject which we then conſider.—Thus, the idea of roundneſs is perfect or adequate, becauſe it offers to the mind all that is in roundneſs in general. On the contrary, the ideas of all ſubſtances are inadequate and imperfect, which are not formed at the pleaſure of the mind, but gathered from certain properties, which experience diſcovers in them. This is evident, becauſe our knowledge of ſubſtance is very defective; and we are only acquainted with ſome of their properties: thus, we know that ſilver is white, that it is maleable, and that it melts, &c. but we do not know what farther properties it may have; and we are wholly ignorant of the inward texture of the particles, whereof it conſiſts.—Our idea of ſilver, therefore, not repreſenting to the mind all the properties of ſilver, is inadequate and imperfect.

ADEQUATELY, *adv.* In an adequate manner; with exactneſs of proportion.

ADEQUATENESS, *n. s.* the ſtate of being adequate; juſtneſs of repreſentation; exactneſs of proportion.

ADERBIGAN, or Aderbijan, a province of Perſia, bounded on the S. by Irac-Agemi, on the E. by Ghilan, and on the W. by Curdiſtan. The principal town is Tauris; Long. from 122 to 129. E. Lat. from 36 to 39. N.

ADERNO, a ſmall place in the Val di Demona in the kingdom of Sicily: anciently Adranam. Long. 90. 30. E. Lat. 38. 5. N.

ADES, or **HADES**, denotes the inviſible ſtate. In the heathen mythology it comprehends all thoſe that lie beyond the river Styx, viz. Erebus, Tartarus, and Elyſium. See HELL.

ADESPOTICK, *adj.* Not abſolute; not deſpotick.

ADESSENARII, ADESSENARIANS, in church hiſtory, a ſect, who hold that Jeſus Chriſt is really preſent in the Euchariſt; but in a manner different from tranſubſtantiation. The Adeſſenarii, called alſo Impanatores, hold different opinions on this point.—Some hold that the body of Jeſus Chriſt is *in* the bread; others that it is *about* the bread: others that it is *with* the bread; and laſtly, others, that it is *under* the bread!

ADFECTED EQUATION, in algebra, is that where the unknown quantity is found in two or more different degrees or powers.

AD FINES, a town of Swiſſerland, ſuppoſed to be the modern Pfin, in the north of the diſtrict of Turgow, on the rivulet Thur, not far from the borders of Suabia, about half way between Conſtance and Frauenfield. It was ſo called, becauſe when Cecinna, general of the Emperor Vitellius, with the auxiliary Rhetians, defeated the Helvetii, the former extended their borders thus far, their territory ending here; and in the time of the Romans, it was the laſt town in this quarter, and of ſome repute.

ADHA, a feſtival which the Mahometans celebrate on the 10th day of the month *Dhoulhegiat*, which is the 12th and laſt of the year. This month being particularly deſtined for the ceremonies which the pilgrims obſerve at Mecca, it takes its name from thence, for the word ſignifies the month of pilgrimage. On that day they ſacrifice, with great ſolemnity, at Mecca, and no where elſe, a ſheep, which is called by the ſame name as the feſtival itſelf. The Turks commonly call this feſtival the Great Beiram, to diſtinguiſh it from the leſſer, which ends their faſt, and which the Chriſtians of the Levant call the Eaſter of the Turks. The Mahometans celebrate this feſtival, out of the city of Mecca, in a neighbouring valley; and ſometimes they ſacrifice there a camel. See BAIRAM.

ADHATODA, in botany, the Malabar nut. Tournefort enumerates four ſpecies of this plant, which by Houſton and Linnæus is called JUSTICIA; (which ſee,) but it is called adhatoda in the Zeylanic tongue, from its virtue of expelling the dead fœtus, which it ſignifies.

To **ADHERE**, *v. n.* 1. To ſtick to; as wax to the finger.—2. To ſtick, in a figurative ſenſe; to be conſiſtent; to hold together.—3. To remain firmly fixed to a party, perſon, or opinion.

ADHERENCE, or ADHERENCY, *n. s.* 1. The quality of adhering or ſticking; tenacity.—2. Fixedneſs of mind; ſteadineſs; fidelity. See ADHESION.

ADHERENCE, ACTION OF, in Scots law, an action competent to a huſband or wife, to compel either party to adhere, in caſe of deſertion.

ADHERENT, *adj.* 1. Sticking to.—2. United with.

ADHERENT. *n. s.* 1. The perſon that adheres: one that ſupports the cauſe, or follows the fortune of another; a follower, a partiſan.—2. Any thing outwardly belonging to a perſon.

ADHERER, *n. s.* he that adheres.

ADHESION, *n. s.* 1. The act or ſtate of ſticking to ſomething. *Adheſion* is generally uſed in the natural, and *adherence* in the metaphorical ſenſe: as, the *adheſion* of iron to the magnet; and *adherence* of a client to his patron. —2. It is ſometimes taken, like *adherence*, figuratively, for firmneſs in opinion, or ſteadineſs in a practice.

ADHESION, in anatomy, a term for one part ſticking to another, which in a natural ſtate are ſeparate. For the moſt part, if any of thoſe parts in the thorax or belly lie in contact, and inflame, they grow together. The lungs very frequently adhere to the pleura. The dura mater ſometimes adheres to the cranium, and there have been inſtances of adheſions of the inteſtines.

ADHESION, in logic. The ſchoolmen diſtinguiſh two kinds of certitude; the one of ſpeculation which ariſes from the evidence of the thing; and the other of adheſion, or attachment, which does not depend on the evidence, but on the importance of the matter, and the intereſt we have in its truth. Adheſion, or adherence is alſo uſed for the perſiſting in a former opinion or reſolution.

ADHESION, in philoſophy. See COHESION.

ADHESIVE, *adj.* ſticking; tenacious.

To **ADHIBIT**, *v. a.* to apply; to make uſe of.

ADHIBITION, *n. s.* application; uſe.

ADHIL, in aſtronomy, a ſtar of the firſt magnitude, upon the garment of Andromeda, under the laſt ſtar in her foot.

ADJACENCY, *n. s.* 1. The ſtate of lying cloſe to another thing. 2. That which is adjacent.

ADJACENT, *adj.* lying near or cloſe; bordering upon ſomething.

ADJACENT, *n. s.* that which lies next another.

ADIANTHUM, MAIDEN-HAIR; a genus of the order of filices, belonging to the cryptogamia claſs of plants. The fructifications are collected in oval ſpots under the reflected tops of the fronds. The true maiden-hair has been greatly celebrated in diſorders of the breaſt proceeding from a thinneſs and acrimony of the juices; and likewiſe for opening obſtructions of the viſcera, and promoting the expectoration of tough phlegm. Botanical writers enumerate 15 ſpecies of the Adianthum. The three following are the moſt remarkable:

1. **ADIANTHUM CAPILLUS VENERIS**, or true maiden-hair, is a native of the ſouthern parts of France, though it is likewiſe ſaid to grow plentifully in Cornwall and in ſome parts of Great Britain. It grows naturally out of the joints of walls and fiſſures of rocks. It ought therefore to be planted in pots filled with gravel and lime-rubbiſh; where it will thrive much better than in good earth. It muſt alſo be ſheltered under a frame during the winter.

2. **ADIANTHUM PEDATUM**, or American maiden-hair, is a native of Canada; and grows in ſuch quantities that the French ſend it from thence in package for other goods, and the apothecaries of Paris uſe it for maiden-hair in the compoſitions wherein that is ordered. It is alſo common to the United States, Nova Scotia, Newfoundland, &c. where the inhabitants frequently uſe it inſtead of tea. It is uſed either when gathered freſh, or after being kept during the winter. An handful of the leaves is put into a kettle of boiling water, which produces a fragrant and grateful infuſion.

3. **ADIANTHUM TRAPEZIFORME**, or black American

maiden-hair, is a native of Jamaica; and has ſhining black ſtalks, and leaves of an odd ſhape, which make an agreeable variety among other plants. It is ſometimes cultivated in gardens.

ADIAPHOROUS, *adj.* neutral; particularly uſed of ſome ſpirits and ſalts, which are neither of an acid or alkaline nature.

Adiaphorous, Adiaphorus, in chemiſtry, a name given by Mr. Boyle to a kind of ſpirit diſtilled from tartar and ſome other vegetable bodies; and which is neither acid, vinous, nor urinous: but in many reſpects different from any other kind of ſpirit.

ADIAPHORY, *n. s.* neutrality; indifference.

ADIAPNEUSTIA, ſignifies defective perſpective, from denſe pores, &c.

ADIAPTOTOS, a name given by phyſicians to a remedy for the cholic, which is ſtone-paſley, henbane-ſeed, white pepper, &c. made into an electuary.

ADIARRHOEA, in medicine, ſignifies a total ſuppreſſion of all neceſſary evacuations.

ADJAZZO, or Adjaccio, in geography, a handſome town and caſtle of Corſica in the Mediterranean, with a biſhop's ſee, and a good harbour. It is populous, and fertile in wine. It is 27 miles S. W. of Corte. Long. 84. 20. E. Lat. 41. 54. N.

ADICE, a nettle.

To ADJECT, *v. a.* to add to; to put to another thing.

ADJECTION, *n. s.* 1. The act of adjecting, or adding. —2. The thing adjected, or added.

ADJECTITIOUS, *adj.* added: thrown in upon the reſt.

ADJECTIVE, *n. s.* a word added to a noun, to ſignify the addition or ſeparation of ſome quality, circumſtance, or manner of being; as *good*, *bad*, are *adjectives*, becauſe in ſpeech they are applied to nouns, to modify their ſignification, or intimate the manner of exiſtence in the things ſignified thereby.

ADJECTIVELY, *adj.* after the manner of an adjective; a term of grammar.

ADIEU, *interj.* (from *à Dieu*, uſed elliptically for *à Dieu je vous commende*, i. e. I commend you to God: uſed at the departure of friends.) The form of parting, originally importing a commendation to the divine care, but now uſed, in a popular ſenſe, ſometimes to things inanimate; farewell.

ADIGE, a river in Italy, which taking its riſe ſouth of the lake Glace among the Alps, runs forth by Trent, then eaſt by Verona in the territory of Venice, and falls into the Gulph of Venice, north of the mouth of the Po.

This river will ever be memorable in the annals of hiſtory, for the numerous battles fought on its banks during the campaign of Bonaparte, in the year 1796, in which though the Auſtrians, under the command of the celebrated Wurmſer, diſplayed the moſt determined fortitude and perſeverance, ſuch was the unparallelled ardour of the French, as to render all their efforts to ſtop their progreſs ineffectual. Combats ſucceeded one day after another, and victory conſtantly declared herſelf in favour of the French; ſo that Wurmſer, in leſs than a month after the firſt engagement, found his gallant army, which had originally conſiſted of 30 battalions of the fineſt troops of Auſtria, almoſt completely annihilated, 8000 being killed, 13,661 taken priſoners, and 2500 having deſerted, whilſt 105 pieces of cannon, 210 covered waggons, and 400 horſes, fell into the hands of the conquerors. For a particular account of this campaign, ſee French Revolution.

AD INQUIRENDUM, a judicial writ, commanding enquiry to be made of any thing touching a cauſe depending in the king's court, for the better execution of juſtice; as of baſtardy or the like.

To ADJOIN, *v. a.* 1. To join to; to put to; to unite to.—2. To faſten by a joint or juncture.

To Adjoin, *v. n.* to be contiguous to; to lie next ſo as to have nothing between.

To ADJOURN, *v. a.* To put off to another day, naming the time; a term uſed in juridical proceedings; as, of parliaments, congreſſes, and other legiſlative aſſemblies, or courts of juſtice.—2. To put off; to defer; to let ſtay to a future time.

ADJOURNMENT, *n. s.* 1. An aſſignment of a day, or a putting off till another day.—2. Delay; procraſtination; diſmiſſion to a future time.

Adjournment, in law, the putting off a court or meeting, and appointing it to be kept at another time or place. The word is formed of the Latin propoſition *ad*, and the French word *jour*, day, q. d. another day. In this ſenſe we meet with the phraſe *adjournment in eyre*, for an appointment of a day, on which the juſtices in *eyre* intend to ſit again. There is a difference between the words *adjournment* and *prorogation*, when applied to the Britiſh parliament, the former being not only for a ſhorter time but alſo done by the authority of the two houſes, whereas the latter is an act of royal authority. An adjournment of one houſe cannot take place during the ſeſſion of congreſs, for more than three days, nor to any other place than that in which the two houſes are ſitting. Fed. Con. Art. 1ſt. § 5th, But in caſe of diſagreement between the two houſes, with reſpect to the time of adjournment, the preſident may adjourn them to ſuch time as he may think proper. Fed. Con. Art. 2d. §.

The Supreme Court of the United States may be adjourned by one or more judges preſent, from day to day, until a quorum ſhall be convened. Laws of the U. S. 1ſt Seſſ. 1ſt Con. § 6. In like manner a circuit court, or in caſe no judge attends, by the marſhal, from day to day, till a judge attends. Or by the written order of a judge to the marſhal, to ſuch a day before the next ſeſſion as the judge ſhall appoint, In caſe of the death of a judge, or vacancy, all ſuits pending ſhall be continued to the next term after the appointment and acceptance of a ſucceſſor. Laws of U. S. 1ſt. Con. 1ſt Seſſ. c. 20. § 5. If no judge of the ſupreme court attends within four days after the appointed period, the judge of the diſtrict court, or, in his abſence, the marſhal is authoriſed to adjourn the court till next term. Laws U. S. 3d. Con. 1ſt Seſſ. c. 33.

ADIPAL, fat, groſs.

ADIPOSA Membrana, in anatomy, a membrane that incloſes the *Cellulæ Adiposæ*.

Adiposa Vena, in anatomy, a vein, ariſing from the deſcending trunk of the Cava, which ſpreads itſelf on the coat and fat that covers the kidneys.

ADIPOSE, a term uſed by anatomiſts for any cell, membrane, &c. that is remarkable for its fatneſs. See Adeps.

ADIPOSI DUCTUS, in anatomy, veſſels which convey the fat into the interſtices of the muſcles, or part between the fleſh and the ſkin.

ADIPOUS, *adj.* fat.

ADIPSON, a name given by Hippocrates, to oxymel, the ptiſſana, and other medicines, adminiſtered for allaying thirſt.

ADIPSOS, ſignifies the Egyptian palm-tree, liquorice, and a pill, or catapotium, compoſed by Aſclepiades, and mentioned by Galen.

ADIRBEITSAN, in geography, a province of Perſia, in Aſia, and part of the ancient Media. It is bounded on the N. by the province of Shirvan, on the S. by Irac Agemi and Curdiſtan, on the E. by Ghilan and the Caſpian ſea, and on the W. by Turcomania.

ADIRIGE, *sal ammoniccum*.

ADIT, *n. s.* a paſſage for the conveyance of water under ground; a paſſage under ground in general; a term among thoſe belonging to the mines.

Adit of a Mine, the hole or aperture, whereby it is entered and dug, and by which the water and ores are carried away. The term amounts to the ſame with *cuniculus* or *drift*, and is diſtinguiſhed from *air-shaft*. The adit is uſually made on the ſide of a hill, towards the bottom thereof, about 4, 5, or 6 feet high, and 8 wide, in form of an arch; ſometimes cut in the rock, and ſometimes ſupported with timber, ſo conducted as that the ſide or bottom of the adit may anſwer to the bottom of the ſhaft, only ſomewhat lower, that the water may have a ſufficient current to paſs away without the uſe of the pump. Damps and the impurity of the air are the great impediments againſt driving adits above 20 or 30 fathoms, by reaſon of the neceſſity, in this caſe, of letting down air-ſhafts from the day to meet the adit, which are often very expenſive, both on account of the great depth of mines, and the hardneſs of the mineral ſtrata, to be cut through. The beſt remedy againſt this is that practiſed in the coal mines near Liege, where they work their adits without air-ſhafts; the manner of which is deſcribed by Sir Robert Moray. Adit of a mine is ſometimes uſed for the air-ſhaft itſelf, being a hole driven perpendicularly from the ſurface of the earth into ſome part of a mine, to give entrance to the air. To draw off the ſtanding water in winter, in deep mines, they drive up an adit, or air-ſhaft, upon which the air diſengages itſelf from the water, when it begins to run with ſuch violence as produces a noiſe equal to the burſting of a cannon, daſhes every thing in the way againſt the ſides of the mine, and looſens the very rocks at a diſtance.

ADITION, *n. s.* the act of going to another.

To **ADJUDGE**, *v. a.* 1. To give the thing controverted to one of the parties by a judicial ſentence.—2. To ſentence, or condemn to a puniſhment.—3. Simply, to judge; to decree; to determine.

To **ADJUDICATE**, *v. a.* to adjudge; to give ſomething controverted to one of the litigants, by a ſentence or deciſion.

ADJUDICATION, *n. s.* the act of judging, or granting ſomething to a litigant, by a judicial ſentence.

Adjudication, in Scots law, the name of that action by which a creditor attaches the heritable eſtate of his debtor, or his debtor's heir, in order to approriate it to himſelf, either in payment or ſecurity of his debt; or that action by which the holder of an heritable right, labouring under any defect of form, may ſupply that defect. Many of our American merchants, who had veſſels taken by the cruiſers of Great-Britain, during the late war, between that country and France, will long remember the meaning which was then annexed to the word *adjudication*. It frequently happened, that veſſels belonging to the United States, whilſt engaged in their lawful commerce, were detained, under the moſt frivolous pretexts, and ſent into ſome of the Weſt-India iſlands for *adjudication*, when the honeſt judges, moſt of whom, by being partners in the privateers, were intereſted in the deciſions, for a long time, acted with ſo great uniformity, as to render the words *adjudication* and *condemnation* ſynonimous terms.

To **ADJUGATE**, *v. a.* to yoke to; to join to another by a yoke.

ADJUMENT, *n. s.* help; ſupport.

ADJUNCT, *adj.* united with; immediately conſequent.

Adjunct, *n. s.* 1. Something adherent or united to another, though not eſſentially part of it.—2. A perſon joined to another.

Adjunct, in metaphyſics, ſome quality belonging to either body or mind, whether natural or acquired. Thus thinking is an adjunct of the mind, and growth an adjunct of the body.

Adjunct, in muſic, a word which is employed to denominate the connection or relation between the principal mode and the modes of its two fifths, which, from the intervals that conſtitute the relation between them and it, are called its adjuncts.

Adjunct, in philoſophy, ſignifies ſomething added to another, without being any neceſſary part of it. Thus water abſorbed by cloth or a ſponge, is an adjunct, but no neceſſary part of either of theſe ſubſtances.

Adjuncts, in rhetoric and grammar, ſignify certain words or things added to others, to amplify or augment the force of the diſcourſe.

Adjuncts, in the royal academy of ſciences at Paris, denote a claſs of members, attached to the purſuit of particular ſciences. The claſs of adjuncts was created in 1716, in lieu of the *Eleves*: they were 12 in number; 2 for geometry, 2 for mechanics, 2 for aſtronomy, 2 for anatomy, 2 for chemiſtry, and 2 for botany. The Eleves not taken into this eſtabliſhment were admitted on the foot of ſupernumerary Adjuncts.

Adjuncts of the Gods, or Adjunct Gods, among the Romans, were a kind of inferior deities, added as aſſiſtants to the principal ones, to eaſe them in their functions. Thus, to Mars was adjoined Bellona and Nemeſis; to Neptune, Salacia; to Vulcan, the Cabiri; to the Good Genius, the Lares; to the Evil, the Lemures, &c.

ADJUNCTION, *n. s.* 1. The act of adjoining, or coupling together.—2. The thing joined.

ADJUNCTIVE, *n. s.* 1. He who joins.—2. That which is joined.

ADJURATION, *n. s.* 1. The act of adjuring, or propoſing an oath to another.—2. The form of oath propoſed to another.

To **ADJURE**. *v. a.* to impoſe an oath upon another, preſcribing the form in which he ſhall ſwear.

To **ADJUST**, *v. a.* 1. To regulate; to put in order; to ſettle in the right form.—2. To reduce to the true ſtate or ſtandard; to make accurate.—3. To make conformable.

ADJUSTMENT, *n. s.* 1. Regulation; the act of putting in method; ſettlement.—2. The ſtate of being put in method, or regulated.

ADJUTAGE. See Ajutage.

ADJUTANT, *n. s.* an officer, whoſe duty it is to aſſiſt the major, by diſtributing the pay, and overſeeing the puniſhment, of the common men.

Adjutant, in the military art, is an officer whoſe buſineſs, beſides what is above mentioned, is to receive the orders every night from the brigade major; which, after carrying them to the colonel, he delivers out to the ſerjeants. When detachments are to be made, he gives the number to be furniſhed by each company or troop, and aſſigns the hour and place of rendezvous. He alſo places the guards; receives, and diſtributes the ammunition to the companies, &c. and, by the major's orders, regulates the diſcipline of the corps. See Military Affairs.

ADJUTOR, *n. s.* a helper.

ADJUTORIUM, in anatomy, the ſhoulder-bone.

Adjutorium, a term uſed by phyſicians for any medicine in a preſcription but the capital one.

ADJUTORY, *adj.* that which helps.

An ADJUTRIX, *n. s.* ſhe who helps.

ADJUVANT, *adj.* helpful; uſeful.

To ADJUVATE, *v. a.* to help; to further; to put forward.

ADLEGATION, in the public law of the German empire, a right claimed by the ſtates of the empire by adjoining plenipotentiaries, in public treaties and negociations, to thoſe of the emperor, for the tranſacting of matters which relate to the empire in general. In which ſenſe adlegation differs from legation, which is the right of ſending ambaſſadors on a perſon's own account. Several princes and ſtates of the empire enjoy the right of legation, who have not that of adlegation, and vice verſa. The biſhops, for inſtance, have the right of adlegation in the treaties which concern the common intereſt, but no right of legation for their own private affairs. The Duke of Mantua had the like. The emperor allows the princes of Germany the privilege of legation, but diſputes that of adlegation. They challenge it as belonging to them *jure regni*, which they enjoy in common with the emperor himſelf.

AD LIBITUM, in muſic books, as you pleaſe.

ADMANUENSES, in ancient law books, denote perſons who ſwore by laying their hands on the book. In which ſenſe, admanuenſes amount to the ſame with laymen; and ſtand oppoſed to clerks, who are forbid to ſwear on the book, their word being to be reputed as their oath; whence they are alſo denominated *fide digni*.

ADMEASUREMENT, *n. s.* [See Measure.] The adjuſtment of proportions; the act or practice of meaſuring according to rule. *Admeaſurement* is a writ, which lieth for the bringing of thoſe to a mediocrity, that uſurp more than their part. It lieth in two caſes; one is termed *admeaſurement* of dower, where the widow of the deceaſed holdeth from the heir, or his guardian, more in the name of her dower, than belongeth to her. The other is *admeaſurement* of paſture, which lieth between thoſe that have common of paſture appendant to their freehold, or common by vicinage, in caſe any one of them or more, do ſurcharge the common with more cattle than they ought.

ADMENSURATION, *n. s.* the act, or practice of meaſuring out to each his part.

ADMINICLE, *n. s.* help; ſupport; furtherance.

Adminicle, in Scots law, ſignifies any writing or deed referred to by a party, in an action of law, for proving his allegations.

ADMINICULAR, *adj.* that which gives help.

ADMINICULES, among antiquaries, are applied to the attributes, or ornaments wherewith Juno and ſome other figures are repreſented on medals.

To ADMINISTER, *v. a.* 1. To give; to afford; to ſupply.—2. To act as the miniſter or agent in any employment, or office.—3. To adminiſter juſtice; to diſtribute right.—4. To adminiſter the ſacraments.—5. To propoſe, or require an oath authoritatively.—6. To give phyſic as it is wanted.—7. *To adminiſter* to; to contribute; to bring ſupplies.—8. To perform the office of an adminiſtrator, in law. See Administrator.

ADMINISTRATION, *n. s.* 1. The act of adminiſtering or conducting any employment; as, the conducting the public affairs; diſpenſing the laws.—2. The active or executive part of government.—3 Collectively, thoſe to whom the care of public affairs is committed.—4. Diſtribution; exhibition; diſpenſation.

Administration, in anatomy, is uſed for the manner of diſſecting the parts of the body, particularly the muſcles. In which ſenſe, adminiſtration is ſynonymous with *encheireſis*, exerciſe, &c. Anatomical adminiſtrations are not to be learned by oral precepts, but require ocular inſpection.—Galen, Harvey, and others, have diſcourſes expreſs under the title of the anatomical adminiſtrations.

Administration, in commerce, the name given by the Spaniards in Peru to the ſtaple magazine, or warehouſe, eſtabliſhed at Callao, a ſmall town on the S. Sea, which is the port of Lima, the capital of that part of S. America, and particularly of Peru. The foreign ſhips, which have leave to trade along that coaſt, are obliged to unload here, paying 13 *per cent.* of the price they ſell for, if the cargo be entire, and even 16 *per cent.* if otherwiſe; beſides which, they pay 3 *per* 1000, duty, for conſulſhip and ſome other ſmall royal rights and claims.

ADMINISTRATIVE, *adj.* that which adminiſters; that by which any one adminiſters.

ADMINISTRATOR, *n. s.* 1. Is properly taken for him that has the goods of a man dying inteſtate, committed to his charge, and is accountable for the ſame.—2. He who officiates in divine rites.—3. He who conducts the government.

Administrator, in government, is ſometimes uſed for the preſident of a province; for a perſon appointed to receive, manage, and diſtribute the revenues of an hoſpital or religious houſe; for a prince who enjoys the revenues of a ſecularized biſhopric; and for a regent of a kingdom during a minority of the prince, or a vacancy of the throne.

Administrator, in law, he to whom the ordinary or ſurrogate commits the adminiſtration of the goods of a perſon deceaſed, in default of an executor. An action lies for, or againſt an adminiſtration, as for, or againſt an executor; and he ſhall be accountable to the value of the goods of the deceaſed,

ceaſed, and no farther :—unleſs there be waſte, or other abuſe chargeable on him. If the adminiſtrator die, his executors are not adminiſtrators; but the court is to grant a new adminiſtration. If a ſtranger, who is neither adminiſtrator nor executor, take the goods of the deceaſed, and adminiſter, he ſhall be charged, and ſued as an executor, not as an adminiſtrator. The origin of adminiſtrators is derived from the civil law. Their eſtabliſhment in England is owing to a ſtatute made in the 31ſt year of Edw. III. Till then, no office of this kind was known beſide that of executor; in caſe of a want of which, the ordinary had the diſpoſal of goods or perſons inteſtate, &c.

ADMINISTRATOR, in Scots law, a perſon legally impowered to act for another whom the law preſumes incapable of acting for himſelf. Thus tutors or curators are ſometimes ſtyled *administrators in law* to pupils, minors, or fatuous perſons. But more generally the term is uſed to imply that power, which is conferred by the law upon a father, over the perſons and eſtates of his children during their minority.

ADMINISTRATORSHIP, *n. s.* the office of adminiſtrator.

ADMINISTRATRIX, *n. s.* a woman, to whom is committed the adminiſtration of the goods of a perſon deceaſed, in default of an executor, in which caſe, ſhe is accountable in the ſame manner as an adminiſtrator, which ſee.

ADMIRABILIS SAL, the ſame with GLAUBER's ſalts. See CHEMISTRY.

ADMIRABILITY, *n. s.* the quality or ſtate of being admirable.

ADMIRABLE, *adj.* to be admired; worthy of admiration; of power to excite wonder.

ADMIRABLENESS, *n. s.* the quality of being admirable; the power of raiſing wonder.

ADMIRABLY, *adv.* in an admirable manner.

ARMIRAL, *n. s.* 1. An officer or magiſtrate, that has the government of the king's navy, and the hearing and determining all cauſes, as well civil as criminal, belonging to the ſea.—2. The chief commander of a fleet.—3. The ſhip which carries the admiral or commander of the fleet.

ADMIRAL, *origin of the title.* Authors are divided with regard to the origin and denomination of that important officer, whom we find eſtabliſhed in moſt nations which border on the ſea. But the moſt probable opinion is that of Sir Henry Spelman, who thinks, that both the name and dignity were derived from the Saracens, and, by reaſon of the holy wars, brought firſt into Europe; for *admiral*, in the Arabian language, ſignifies a prince, or chief ruler, and was the ordinary title of the governors of cities, provinces, &c. and therefore they called the commander of the navy by that name, as a name of dignity and honour. And indeed there are no inſtances of admirals in Europe before the year 1284, when Philip of France, who had attended St. Lewis in the wars againſt the Saracens, created one, and the example was ſoon after followed by the other European nations, from which time the office has been conſidered as one of the moſt important in maritime ſtates. Before the introduction of the word admiral, the title of *custos maris*, guardian of the ſea, was uſed.

ADMIRAL, LORD HIGH, OF ENGLAND, an officer of great antiquity and truſt, as appears by the laws of Oleron, ſo denominated from the place they were made at by Richard I. The firſt title of Admiral of England, expreſsly conferred upon a ſubject, was given by patent of Richard II. to Richard Fitz-Allen, junr. Earl of Arundel and Surrey; for thoſe who before enjoyed this office were ſimply termed admirals, though their juriſdiction ſeems at large, eſpecially in the reign of Edward III. when the court of admiralty was firſt erected. This great officer has the management of all maritime affairs, and the government of the royal navy, with power of deciſion in all maritime caſes both civil and criminal: he judges of all things done upon or beyond the ſea, in any part of the world; upon the ſea coaſts, in all ports and havens, and upon all rivers below the firſt bridge from the ſea. By him, vice-admirals, rear admirals, and all ſea-captains, are commiſſioned; all deputies for particular coaſts, and coroners to view dead bodies found on the ſea coaſts, or at ſea: he alſo appoints the judges for his court of admiralty, and may impriſon, releaſe, &c. To the lord high admiral belong all penalties and amercements of all tranſgreſſions at ſea, on the ſea-ſhore, in ports and havens, and all rivers below the firſt bridge, from the ſea; the goods of pirates and felons condemned or enſlaved, ſea-wrecks, goods floating on the ſea, or caſt on the ſhore (not granted to lords of manors adjoining to the ſea) and a ſhare of lawful prizes; alſo all great fiſhes, commonly called *royal fishes*, except whales and ſturgeons: to which add, a ſalary of $ 31,080 a year. In ſhort, this is ſo great an office, in point of truſt, honour, and profit, that it has been uſually given to princes of the blood, or the moſt eminent perſons among the nobility. The Britiſh have had no high admiral for ſome years; the office being put in commiſſion, or under the adminiſtration of the lords commiſſioners of the admiralty, who by ſtatute have the ſame power and authority as the lord high admiral.

ADMIRAL, LORD HIGH, OF SCOTLAND, one of the great officers of the crown, and ſupreme judge in all maritime caſes within that part of Britain. See LAW.

ADMIRAL, REAR, is the commander of the third ſquadron, and carries his flag at the mizen top-maſt head.

ADMIRAL, VICE, is the commander of the ſecond ſquadron, and carries his flag at the fore-top-maſt head. He is an officer appointed by the lords commiſſioners of the admiralty. There are ſeveral of theſe officers eſtabliſhed in different parts of Great-Britain, with judges and martials under them, for executing juriſdiction within their reſpective limits. Their decrees, however, are not final, an appeal lying to the court of admiralty in London.

ADMIRAL is alſo an appellation given to the moſt conſiderable ſhip of a fleet of merchantmen, or of the veſſels employed in the cod-fiſhery of Newfoundland. The commander of this laſt has the privilege of chooſing what place he pleaſes on the ſhore to dry his fiſh; gives proper orders and appoints the fiſhing-places to thoſe who come after him; and as long as the fiſhing-ſeaſon continues, he carries a flag on his main-maſt.

ADMIRAL, in zoology, or rather conchology, the name given by authors to a very beautiful, and very precious ſhell-fiſh of the *voluta* genus. See VOLUTA. Of theſe the curious reckon four ſpecies. 1. The grand-*admiral*. 2. The vice-*admiral*. 3. The orange-*admiral*. 4. The extra-*admiral*. The firſt of theſe is the moſt eſteemed, and a ſingle ſhell has been ſold in Holland, for upwards of $ 200. It is of a very elegant and bright white enamel, and is variegated with bands of yellow, repreſenting in ſome degree the colours of the flags of a man of war at ſea; hence it obtained its name. It is of a very curious ſhape, and formed with particular elegance about the head; the clavicle being exerted. There runs along the centre of the large yellow band in this ſhell, a fine denticulated line, which is its diſtinguiſhable character. The vice-*admiral*, is an elegant ſhell, but its head is leſs beautifully wrought than in the *admiral*, and its broad band wants the denticulated line, ſo remarkable in that. The orange-*admiral* has more yellow than either of the others. The extra-*admiral* has the ſame bands with theſe, but they run into one another, and form a more mixed clouding.

ADMIRALSHIP, *n. s.* the office or power of an admiral.

ADMIRALTY, *n. s.* the power, or officers appointed for the adminiſtration of naval affairs.

ADMIRALTY properly ſignifies the office of lord high admiral, whether diſcharged by one ſingle perſon, or by joint commiſſioners called *lords of the admiralty*.

ADMIRALTY BAY, and PORT MULGRAVE, lies on the weſtern coaſt of North America, in Lat. 59, 31 N. Lon. 65, 18 W.

ADMIRALTY, COURT OF, is a ſovereign court, where cognizance is taken in all maritime affairs, whether civil or criminal. All crimes committed on the high ſeas, are cognizable in this court only, and before which they muſt be tried by judge and jury. But in civil caſes the mode is different, the deciſions being all made according to the civil law. From the ſentences of the admiralty judge an appeal always lies in ordinary courſe, to the chancery. Appeals frym the vice-admiralty courts in the Britiſh ſettlements abroad, may be brought before the courts of admiralty in England, as being a branch of the admiral's juriſdiction, though they may alſo be brought before the king in council. But in caſe of prize veſſels, taken in time of war, in any part of the world, and condemned in any courts of admiralty or vice-admiralty as lawful prize, the appeal lies to certain *commiſſioners of appeals* conſiſting chiefly of the privy council, and not to judge delegates. And this by virtue of divers treaties with foreign nations, by which particular courts are eſtabliſhed in the maritime countries of Europe for the deciſion of this queſtion, Whether lawful prize or not? fot this being a queſtion between ſubjects of different ſtates, it belongs entirely to the law of nations, and not to the municipal laws of either country, to determine it.

ADMIRALTY, court of, in Scotland. See LAW.

ADMIRALTY ISLANDS, lie in about 2. 18. S. Lat. and 138, 37 W. Long. There are between 20 and 30 of theſe iſlands, the largeſt of which is about 18 leagues in length. Captain Carteret, who firſt diſcovered them, deſcribes them as clothed with beautiful verdure of woods, interſperced with ſpots that have been cleared for plantations, groves of cocoa nut trees, and houſes of the natives, who ſeem to be very numerous. He thinks it highly probable, that theſe iſlands produce ſeveral valuable articles of trade, particularly ſpices, as they lie in the ſame climate and latitude with the Moluccas.

ADMIRALTY JURISDICTION in the United States. The diſtrict courts of the United States, have excluſive juriſdiction of all thoſe caſes, which are uſually termed admiralty caſes. See LAWS of the United States, 1ſt Congreſs, 1ſt Seſſion, chap. 10, ſection 9.

ADMIRATION, *n. s.* wonder; the act of admiring or wondering.

ADMIRATION, in grammar, a note or character intimating ſomething to be admired or wondered at. It is expreſſed thus !

To ADMIRE, *v. a.* 1. To regard with wonder.—2. To regard with love.

To ADMIRE, *v. n.* to wonder.

ADMIRER, *n. s.* the perſon who wonders, or regards with admiration.

ADMIRINGLY, *adv.* with admiration; in the manner of an admirer.

ADMISSIBLE, *adj.* that which may be admitted.

ADMISSION, *n. s.* 1. The act or practice of admitting.—2. The ſtate of being admitted.—3. Admittance; the power of entering.—4. The allowance of an argument; the grant of a poſition not fully proved.

To ADMIT, *v. a.* 1. To ſuffer to enter, to grant entrance.—2. To ſuffer to enter upon an office.

ADMITTABLE, *adj.* the perſon or thing which may be admitted.

ADMITTANCE, *n. s.* 1. The act of admitting; permiſſion to enter.—2. The right or power of entering.—3. Cuſtom.—4. Conceſſion of a poſition.

To ADMIX, *v. a.* to mingle with ſomething elſe.

ADMIXTION, *n. s.* the union of one body with another, by mingling them.

ADMIXTURE, *n. s.* the body mingled with another.

To ADMONISH, *v. a.* to warn of a fault; to reprove gently.

ADMONISHER, *n. s.* the perſon that puts another in mind of his faults or duty.

ADMONISHMENT, *n. s.* admonition, notice of faults or duties.

ADMONITION, *n. s.* the hint of a fault or duty; counſel; gentle reproof.

ADMONITION, in eccleſiaſtical affairs, a part of diſcipline much uſed in the ancient church. It was the firſt act, or ſtep, towards the puniſhment or expulſion of delinquents. In caſe of private offences, it was performed, according to the evangelical rule, privately: in caſe of public offences, openly, before the church. If either of thoſe ſufficed for the recovery of the fallen perſon, all further proceedings in the way of cenſure ceaſed: if they did not, recourſe was had to excommunication.

ADMONITIONER, *n. s.* a general adviſer.

ADMONITORY, *adj.* that which admoniſhes.

ADMORTIZATION, in the feudal cuſtoms, the reduction of the property of lands or tenements to mortmain. See MORTMAIN.

ADMURMURATION, *n. s.* the act of murmuring or whiſpering to another.

ADNATA, in anatomy, a thick white membrane, inveſting the ball of the eye; and making the outermoſt coat thereof: called alſo *circumoſsalis & circumcaloalis*. It is the tunica adnata, that makes what we commonly call the white of the eye: whence it is alſo called the albuginea. It ſprings from the pericarpium, and grows to the [illegible] [illegible] part of the tunica cornea, ſerving to connect the whole eye both to the pelpebræ, and the adjacent bones, and thus keep it faſt in the ſocket. A little round aperture is left in the forepart, called the ſight, through which the iris and pupilla appear. The adnata abounds with veins and arteries, which, though ordinarily not viſible, are conſpicuous in ophthalmies, which are properly inflammations of this part. Adnata is alſo a term uſed for ſuch things as grow upon animal or vegetable bodies, whether inſeparably, as hair, wool, hornes, &c. or accidentally, as the ſeveral epiſtical plants.

Adnata, or Adnascentia, among gardners, denote thoſe off-ſetts, which by a new germination under the earth, proceed from the lilly, narciſſus, hyacinth, and other flowers, and afterwards grow to true roots. The French call them cayeux, ſtalks.

ADNOUN, Adnomen, or Adnme, is uſed by ſome grammarians, to expreſs what we moſt uſually call an adjective.

ADNUBILATED, *adj.* clouded.

To ADNUL, *v. a.* to diſannul.

ADO, *n. s.* 1. Trouble, difficulty.—2. Buſtle, tumult, buſineſs.—3. More ſhow of buſineſs than the affair is worth.

ADOLESCENCE, or Adolescency, the ſtate of growing youth; or that period of a perſon's age commencing from his infancy, and terminating at his full ſtature or manhood. The ſtate of adoleſcence laſts ſo long as the fibres continue to grow, either in magnitude or firmneſs. It is commonly computed to be between 15 and 25, or even 30 years of age; though in different conſtitutions its terms are very different.—The Romans uſually reckoned it from 12 to 25 in boys; and to 21 in girls, &c.—And yet among their writers, *juvenis* and *adolescens* are frequently uſed indifferently, for any perſon under 45 years.

ADON, a populous village in the province of Stuhl-Weiſſemberg, belonging to Hungary. It lies in a fruitful country, near the river Danube. Long. 95. 25. E. Lat. 47. 35. N.

ADONAI, one of the names of the Supreme being in the Scriptures. The proper meaning of the word is *my lords*, in the plural number; *as Adoni* is *my lord*, in the ſingular. The Jews, who either out of reſpect, or ſuperſtition, do not pronounce the name of *Jehovah*, read *Adonai* in the room of it, as often as they meet with Jehovah in the Hebrew text. But the ancient Jews were not ſo ſcrupulous; nor is there any law that forbids them to pronounce the name of God.

ADONI, a town in the peninſula of Hindooſtan, on one of the branches of the river Tungebadda. It was not many years ago, a fine city, extremely well fortified, and the capital of a ſmall feudatory province of Golconda. It lies 175 m. S. W. of Hydrabad, and 310. N. W. of Madras. Long. 152. E. Lat. 15. 37. N.

ADONIC, in poetry, a ſhort kind of verſe, conſiſting of a dactylus and a ſpondeus or a trocheus; ſuch as *rara juventus*. The chief uſe of the Adonic verſe is at the end of each ſtrophe of Sapphic verſe; or among Ariſtophanic anapæſts in the ancient tragedy. But we meet with Adonics by themſelves without Sapphics, as well as Sapphics without Adonics.

ADONIDES, in botany, authors who have given deſcriptions, or catalogues of the plants cultivated in ſome particular place.

ADONION, among the ancient botaniſts, a ſpecies of ſouthernwood, according to Gorræus, which uſed to be ſet in pots, and ſerved as an ornament for gardens.

ADONIS, or Adonius, in ancient geography, a river of Phœnicia, riſing in mount Lebanon, and falling into the ſea, after a north-weſt courſe, at Bybulus.

Adonis, in botany, Birds-Eye, or Pheasants-Eye; a genus of the polyandria order belonging to the polygynia claſs of plants. It is aſſociated with the multiſiliquæ, or 26th natural order. The characters are; the calyx is a perianthium conſiſting of five obtuſe concave leaves, ſomewhat coloured, and deciduous. The corolla has from five to fifteen oblong petals obtuſe and gloſſy. The ſtamina conſiſt of very numerous, ſhort, ſubulated filaments; the antheræ are oblong and inflected. The piſtillum has numerous germina collected in a head; no ſtyli; the ſtigmata acute and reflected. There is no pericarpium; the receptacle is oblong and ſpiked. The ſeeds are numerous, irregular, angular gibbous at the baſe, reflected at the top, ſomewhat prominent, and awnleſs.

ADONISTS, a party among divines and critics, who maintain, that the Hebrew points, ordinarily annexed to the conſonants of the word Jehovah, are not the natural points belonging to that word, nor expreſs the true pronunciation of it but are the vowel points belonging to the words *Adonai* and *Elohim*, applied to the ineffable name Jehovah, which the Jews were forbid to pronounce, and the true pronunciation of which had been long unknown to them, they are always to read *Adonai*. They are oppoſed to *Jehovists*: of whom the principal are Druſius, Capellus, Buxtorf, Alting, and Reland, who has publiſhed a collection of their writings on this ſubject.

ADONIUM, ſee Adonion.

To ADOPT, *v. a.* 1. To take a ſon by choice; to make him a ſon, who was not ſo by birth.—2. To place any perſon or thing in a nearer relation, than they have by nature, to ſomething elſe.

ADOPTEDLY, *adv.* after the manner of ſomething adopted.

ADOPTER, *n. s.* he who gives ſome one by choice the right of a ſon.

Adopter, in chemiſtry. See Receiver.

ADOPTION, *n. s.* 1. The act of adopting.—2. The ſtate of being adopted.

Adoption, in antiquity, was a cuſtom very common among the ancient Greeks and Romans: yet it was not practiſed, but for certain cauſes expreſſed in the laws, and with certain formalities uſual in ſuch caſes. It was a ſort of imitation of nature, intended for the comfort of thoſe who had no children: wherefore he that was to adopt was to have no children of his own, and to be paſt the age of getting any; nor were eunuchs allowed to adopt, as being under an actual impotency of begetting children; neither was it lawful for a young man to adopt an elder, becauſe that it would have been contrary to the order of nature; nay, it was even required that the perſon who adopted ſhould be eighteen years older than his adopted ſon, that there might at laſt appear a probability of being his natural father. Among the Greeks, it was allowed to ſuch as had no iſſue of their own,

own: excepting thoſe who were not their own maſters, e. g. ſlaves, women, madmen, infants, or perſons under 20 years of age; who being incapable of making mills, or managing their own eſtates, were not allowed to adopt heirs to them. The Romans had two forms of adoption; one before the prætor; the other an aſſembly of the people, in the times of the commonwealth, and afterwards by a reſcript of the emperor. In the former, the natural father addreſſed himſelf to the prætor, declared that he emancipated his ſon, reſigned all his authority over him, and conſented he ſhould be tranſlated into the family of the adopter. The latter was practiſed, where the party to be adopted was already free; and this was called *adrogation.* The perſon adopted changed all his names; aſſuming the prename, name, and ſurname of the perſon who adopted him.—Among the Turks, the ceremony of adoption is performed by obliging the perſon adopted to paſs through the ſhirt of the adopter. Hence, among that people, to adopt, is expreſſed by the phraſe, *to draw another through my ſhirt.* It is ſaid, that ſomething like this was anciently obſerved among the Hebrews; as the prophet Elijah adopted Eliſha for his ſon and ſucceſſor, and communicated to him the gift of prophecy, by letting fall his cloak or mantle on him. But adoption, properly ſo called, does not appear to have been practiſed among the ancient Jews: Moſes ſays nothing of it in his laws; and Jacob's adoption of his two grandſons, Ephraim and Manaſſeh, is not ſo properly an adoption, as a kind of ſubſtitution, whereby thoſe two ſons of Joſeph were allotted an equal portion in Iſrael with his own ſons. Beſides the formalities preſcribed by the Roman law, various other methods have taken place; which have given denominations to different ſpecies of adoption, among the Gothic nations, in different ages.

ADOPTION BY BAPTISM is the ſpiritual affinity which is contracted by god-fathers and god-children in the ceremony of baptiſm. This kind of adoption was introduced into the Greek church, and came afterwards into uſe among the ancient Franks, as appears by the Capitulars of Charlemange. In reality, the god-father was ſo far conſidered as the adoptive father, that his god-children were ſuppoſed to be entitled to a ſhare in the inheritance of his eſtate.

ADOPTION BY MATRIMONY is the taking the children of a wife or huſband, by a former marriage, into the condition of proper or natural children; and admitting them to inherit on the ſame footing with thoſe of the preſent marriage. This is a practice peculiar to the Germans; among whom, it is more particularly known by the name of *einkindscraft;* among their writers in Latin, by that of *unio prolium,* or *union of iſſues*

ADOPTION, in theology, is a federal act of God's free grace; whereby thoſe who are regenerated by faith, are admitted into his houſehold, and intitled to a ſhare in the inheritance of the kingdom of heaven.

ADOPTIVE, *adj.* 1. He who is adopted by another, and made his ſon.—2. He who adopts another, and makes him his ſon.

ADOPTIVE GODS were the gods of other nations, adopted by the ancient Romans, and ſo ſtiled in contradiſtinction to domeſtic ones. They were taken chiefly from the Egyptians; ſuch as Iſis, Oſiris, Anubis, Apis, Harpocrates, Canopus, &c.

ADORABLE, *adj.* that which ought to be adored; that which is worthy of divine honours.

ADORABLENESS, *n. s.* the quality of being adorable; worthineſs of divine honours.

ADORABLY, *adj.* in a manner worthy of adoration.

ADORAT, a chemical weight of 4 pounds.

ADORATION, *n. s.* 1. The external homage paid to the divinity, diſtinct from mental reverence.—2. Homage paid to perſons in high place or eſteem.

ADOTATION, among the ancients, literally ſignified, to apply the hand to the mouth; *Manum ad os admovere, q. d.* to kiſs the hand; this being, in the eaſtern countries one of the greateſt marks of reſpect and ſubmiſſion. The ceremony of adoration among the ancient Romans was thus: The devotee having his head covered, applied his right hand to his lips, the fore-finger reſting on his thumb, which was erect, and thus bowing his head, turned himſelf round from left to right. The kiſs thus given was called *oſcolum labratum;* for ordinarily they were afraid to touch the images of their gods themſelves with their profane lips. Sometimes, however, they would kiſs their feet, or even knees, it being held an incivility to touch their mouths; ſo that the adoration paſſed at ſome diſtance. Saturn, however, and Hercules, were adored with the head bare; whence the worſhip of the laſt was called *inſtitutum peregrinum,* and *ritus Græcanicus,* as departing from the cuſtomary Roman method, which was to ſacrifice and adore with the face veiled, and the clothes drawn up to the ears, to prevent any interruption in the ceremony by the ſight of unlucky objects.—The Jewiſh manner of adoration was by proſtration, bowing, and kneeling. The chriſtians adopted the Grecian rather than the Roman method, and adored always uncovered. It is, indeed, ſaid that the Quakers or Society of Friends adore covered; but this is a miſtake; for though they generally ſit covered, in their places of religious ſhorſhip, whenever a prayer is offered up to the Almighty, they all ſtand up uncovered. The Aſiatics, both Hindoes and muſſelmen uncover their feet; and this mode of adoration was not unknown to the ancient Hebrews, for we find Moſes directed "to take the ſhoes from off his feet, becauſe the place whereon he ſtood was holy ground."

ADORATION, as addreſſed to princes, &c. has been variouſly performed. The Perſian manner of adoration, introduced by Cyrus, was by bending the knee, and falling on the face at the prince's feet, ſtriking the earth with the forehead, and kiſſing the hand. This ceremony, which the Greeks called *proſkunein,* Conon refuſed to perform to Artaxerexes, and Caliſthenes to Alexander the Great, as reputing it inpious and unlawful. The adoration performed to the Roman and Grecian emperors conſiſted in bowing or kneeling at the prince's feet, laying hold of his purple robe, and preſently withdrawing the hand and clapping it to the lips. Bare kneeling before the emperor, to deliver a petition, was alſo called adoration. The practice of adoration may be ſaid to be ſtill ſubſiſtiug in England, in the ceremony of kiſſing the king's and queen's hand, and in ſerving them at table, both being performed kneeling, on one knee.

ADORATION, in the court of Rome, is uſed for the c[illegible]mony of kiſſing the pope's feet. Theſe pontiffs findi[illegible] ſtrong diſpoſition in the people to fall down before tl[illegible] kiſs their feet, procured crucifixes to be faſtened [illegible] ſlippers; by which the adoration intended for the p[illegible] ſon is ſuppoſed to be transferred to Chriſt. The word is alſo applied to a method of electing a pope. The election is performed two ways; by *adoration* and by *scrutiny*. In the former, the cardinals ruſh haſtily, as if agitated by ſome ſpirit, to the adoration of ſome one among them, to proclaim him pope. In the latter, they do not adore the new pope till he is placed on the altar.

Adoration, Relative, is that worſhip which is paid to an object, as belonging to, or repreſentative of another. In this ſenſe, the Catholics profeſs to adore the croſs, not ſimply or immediately, which they allow would be idolatry, but in reſpect of Jeſus Chriſt, whom they ſuppoſe to be on it. The Jeſuits in China carry an image of Chriſt under their cloaths, and to this refer mentally the public adorations they offer to Chacinchoan.

Adoration, Supreme, or Absolute, the higheſt degree of religious honour or worſhip rendered to a being, as ſuppoſing him the ſupreme God; in oppoſition to ſubordinate worſhip given to inferior beings. It is termed *abſolute*, as rendered immediately to a being in conſideration of his own eſſential perfections, and terminating in himſelf; and ſtands oppoſed to relative or mediate adoration.

To ADORE, *v. a.* to worſhip with external homage; to pay divine honours.

ADORER, *n. s.* he that adores; a worſhipper; a lover.

To ADORN, *v. a.* 1. To dreſs; to deck the perſon with ornaments.—2. To ſet out any place or thing with decorations.—3. To embelliſh with oratory.

ADOSCULATION, a term uſed by Dr. Grew, to imply a kind of impregnation, without intermiſſion; and in this manner he ſuppoſes the impregnation of plants is effected by the falling of the farina fœcundants on the piſtil.

ADOUR, a river of France, which riſes in the mountains of Bigorre, in the department of the upper Pyrenees, and running N. by Tarbes through Gaſcony, afterwards turns E. and paſſing by Dax, falls into the bay of Biſcay, below Bayonne.

ADOWN, *adv.* down; on the ground.

Adown, *prep.* down; towards the ground.

AD QUOD DAMNUM, in the Engliſh law, a writ directed to the ſheriff, commanding him to inquire into the damage which may befal the king, or other perſon, by granting certain privileges to a place, ſuch as a fair, a market, or the like; or by granting lands in fee-ſimple to a body politic; or by turning or changing high-ways; in which caſes, the party aggrieved may complain to the juſtices, at next quarter ſeſſion; failing which complaint the inquiſition is recorded and becomes binding.

ADRA, a ſea-port town of Granada in Spain, 47 miles S. E. of Granada, and 22 S. W. of Almeira. It was formerly called Abdara. Long. 72. 23. E. Lat. 36. 42. N.

ADRAGANTH, in medicine, gum dragon. It diſtils by inciſion, from the trunk or roots of a plant which grows in the Levant. The gum is of different colours, white, red, grey, and black, and is uſeful in medicine. Skinners uſe great quantities of it, in preparing their leat [illegible] r, and prefer the red and black, though all others uſe the [illegible] r grey.

ADRAMYTTENUS Sinus, a part of [illegible] a, on the coaſt of Myſia.

ADRAMYTTIUM, in anci [illegible]
miti; a town of Myſia M [illegible]

Athenian colony, with a harbour and dock near the Caicus.

Adramyttium, a city on the N. coaſt of Africa, weſtward of Egypt.

ADRANA, a river of Germany, now the Eder, riſing on the borders of the county of Naſſau, to the north-eaſt of, and not far from Dillenburg, running through the landgraviate of Heſſe, the county of Waldeck, by Fritzlar, and then again through the landgraviate, and, together with the Fulda, falling into the Weſer, to the ſouth of, and not far from Caſſel.

ADRANUM, or Hadranum, in ancient geography, now *Aderno*; a town of Sicily, built by the elder Dionyſius, at the foot of mount Ætna, 400 years before Chriſt.

ADRANUS, a river of Sicily, now called *Fiume d'Aderno*.

ADREAD, *adv.* in a ſtate of fear; frighted; terrified.

ADRIA, or Hadria, in ancient geography, a town of Italy, on the river Vomanus, in the territory of the Piceni, (to which Antonine's Itinerary from Rome is directed,) the country of the anceſtors of the emperor Adrian, and from which the Adriatic ſea is ſaid to have been denominated.

Adria, in modern geography, a town of Italy, in the territory of Venice, which alſo claims the given name to the Adriatic ſea. It is at preſent very inconſiderable, though it has a biſhop's ſee. It was called *Atria* by Pliny and Ptolemy, and *Adrias* by Strabo. It lies 27 miles S. S. W. of Venice. Long. 87. 5. E. Lat. 44. 8. N.

ADRIANO a Sierra, or a mountain of Adriano, in Guipuſcoa, a ſubdiviſion of the province of Biſcay, in Spain. There is a road over it to Aalba and Old Caſtile, which is very difficult. At the beginning of this road there is a dark path of 40 or 50 paces cut through a rock; after which it paſſes over the mountain, which is one of the higheſt of the Pyrenees. Theſe mountains are little frequented and have no inhabitants except a few ſhepherds.

ADRIANOPLE, a city of Turky in Europe, in the province of Romania, and the ſee of an archbiſhop under the patriarch of Conſtantinople. It is about 7 or 8 miles in circumference, including the old city and ſome gardens. The houſes are low, moſtly built of mud and clay, and ſome of brick: and the ſtreets are exceedingly dirty. The walls and towers are in a great meaſure fallen into decay. However, there is a beautiful bazar, or market, half a mile long, called Ali Baſſe. It is a vaſt arched building, with 6 gates, and 365 well furniſhed ſhops, kept by Turks, Armenians, and Jews. The number of inhabitants of all nations and religions may be about 100,000; but it is dear living here, becauſe the proviſions are brought from diſtant places. The air is wholeſome, and the country very pleaſant in the ſummer time, on account of the river and ſtreams that run near the city. Theſe promote and preſerve the verdure of the gardens, meadows, and fields, for a conſiderable part of the year. Sultan Selim's moſque ſtands on the ſide of a hill, in the midſt of the city; and hence this magnificent ſtructure may be ſeen on all ſides. Every thing made of gold and ſilver, jewels, piſtols, ſcimetars, &c. are ſold in another part of the city, called by travellers the Bizeſtein, though it differs little from a bazar. This contains about 200 ſhops, and is covered like the former: but the covering is ſupported by two rows of large pillars. e grand viſier's palace is nothing more than a convenient houſe, built after the Turkiſh manner. The emperor's ſeraglio is a regular ſtructure, in a plain near the river Tungia. It is 2 miles in compaſs, and has 7 gates, beſides thoſe of the gardens, which are ſeveral miles in circumference. In the time of the plague, or war, the grand ſignior ſometimes reſides here. The Turks took this city from the Greeks in 1362, and made it the capital of the empire till Mahomet II. took Conſtantinople, in 1453. Long. 101. 27. E. Lat. 41. 45. N.

ADRIAN'S WALL, near the borders between England and Scotland. This work, though called by the Roman hiſtorians *murus*, which ſignified a wall of ſtone, was only compoſed of earth covered with green turf. It was carried on from the Solway Firth, a little weſt of the village of Burgh on the Sands, in as direct a line as poſſible, to the river Tyne on the eaſt, at the place where the town of Newcaſtle now ſtands; ſo that it muſt have been above 60 miles in length. It conſiſted of 4 parts: 1. The principal *agger*, mound of earth, or rampart on the brink of the ditch. 2. The ditch on the north ſide of the rampart. 3. Another rampart on the ſouth ſide of the principal one, about five paces diſtant from it. 4. A large rampart on the north ſide of the ditch.—This laſt was probably the military way to the line of forts on this work: it was ſo to thoſe formerly built by Agricola; and if it did not ſerve the ſame purpoſe in this, there muſt have been no military way attending it.—The ſouth rampart might ſerve for an inner defence in caſe the enemy ſhould beat them from any part of the principal rampart, or it might be deſigned to protect the ſoldiers from any ſudden attack of the provincial Britons.—For many ages this work hath been in ſo ruinous a condition, that it is impoſſible to diſcover its original dimenſions with certainly. From their appearance it ſeems probable that the principal rampart was at leaſt 10 or 12 feet high, and the ſouth one not much leſs; but the north one was conſiderably lower. From the dimenſions of the ditch, taken as it paſſes through a lime-ſtone quarry near Harlow-hill, it appears to have been 9 feet deep, and 11 wide at the top, but ſomewhat narrower at the bottom. The north rampart was about 20 feet diſtant from the ditch.

ADRIANUM, or ADRIATICUM, MARE, the Adriatic ſea, in ancient geography, now the Gulph of Venice, a large bay in the Mediterranean, between Dalmatia, Sclavonia, Greece, and Italy.

ADRIATIC SEA. See laſt article, and VENICE, GULPH OF.

ADRIFT, *adv.* floating at random.

ADROGATION, in Roman antiquity, a ſpecies of adoption, whereby a perſon who was capable of chooſing for himſelf was admitted by another into the relation of a ſon. The word is compounded of *ad* to, and *rogare* to aſk; on account of a queſtion put in the ceremony of it, Whether the adoptor would take ſuch a perſon for his ſon? and another to the adoptive, Whether he conſented to become ſuch a perſon's ſon?

ADROIT, *adj.* dextrous; active; ſkilful.

ADROITNESS, *n. s.* dexterity; readineſs; activity.

ADROP, among alchemiſts, denotes either that preciſe matter, as lead, out of which the mercury is to be extracted for the philoſopher's ſtone; or the philoſopher's ſtone itſelf, which is alſo called ſaturn, and plumbum, or lead, azar, azane, and lapis ipſe.

ADRY, *adv.* athirſt; thirſty; in want of drink.

ADSCITITIOUS, *adj.* that which is taken in to complete ſomething elſe, though originally extrinſic; ſupplemental; additional.

ADSCRIPTS, a term uſed by ſome mathematicians, for the natural tangents, called alſo, by Vieta, *proſines*.

ADSON'S TOWN, lies near the N. E. line of the State of New-Jerſey, and S. E. of the Drowned Lands. It is 27 miles N. of Morriſtown, and 24 miles N. W. of Patterſon.

ADSTRICTION, *n. s.* the act of binding together; and applied, generally, to medicaments and applications, which have the power of making the part contract.

ADSTRICTION, in medicine, a term uſed to denote the too great rigidity and cloſeneſs of the emunctories of the body; particularly the pores of the ſkin; alſo to ſignify the ſtyptic quality of medicines. See ASTRINGENTS.

AD TERMINUM QUI PRÆTERIIT, a writ of entry, which lies where a man, having leaſed lands or tenements for terms of life, or years, is, after the time expired, held from them by the tenant, or other ſtranger, who enjoys it, and deforceth the leſſor. The ſame writ alſo lies for the leſſor's heir.

ADUACA, or ATUACA, antiently a large and famous city of the Tungri; now a ſmall and inconſiderable village, called *Torgeren*, in the biſhopric of Liege, to the N. W. of the city of Liege, in the territory of Haſpengow, on the rivulet Jecker, that ſoon after falls into the Maeſe. Long. 80. 52. E. Lat. 50. 54. N.

To ADVANCE, *v. a.* 1. To bring forward, in the local ſenſe.—2. To raiſe to preferment: to aggrandize.—3. To improve.—4. To heighten; to grace; to give luſtre to.—5. To forward; to accelerate.—6. To propoſe; to offer to the public.

To ADVANCE, *v. n.* 1. to come forward.—2. To make improvement.

ADVANCE, *n. s.* 1. The act of coming forward.—2. A tendency to come forward to meet a lover; an act of invitation.—3. Gradual progreſſion; riſe from one point to another.—4. Improvement; progreſs towards perfection.

ADVANCE, in commerce, denotes money paid before goods are delivered, work done, or buſineſs performed.

ADVANCE DITCH, or FOSSE, in fortification, denotes a ditch of water round the eſplanade, or glacis of a place; to prevent its being ſurpriſed by the beſiegers. See FOSSE.

ADVANCE-GUARD, or VAN-GUARD, in the military art, is the firſt line, or diviſion of an army ranged, or marching in battle-array; or that part of it which is next the enemy, or marches firſt towards them. The whole body of an army is divided into advance-guard, rear-guard, and main body. The word is ſometimes alſo applied to a ſmall party of horſe, viz. 15 or 20, commanded by a lieutenant, beyond, and in ſight, of the main guard.

ADVANCEMENT, *n. s.* 1. The act of coming forward.—2. The ſtate of being advanced; preferment.—3. The act of advancing another.—4. Improvement; promotion to a higher ſtate of excellence.

ADVANCER, *n. s.* he that advances any thing; a promoter; forwarder.

ADVANCER, among ſportſmen, one of the ſtarts or branches of a buck's attire, between the back antler and the palm.

ADVANTAGE, *n. s.* 1. Superiority.—2. Superiority gained by ſtrength; or unlawful means.—3. Opportunity; convenience.—4. Favourable circumſtances.—5. Superior excellence.—6. Gain; profit.—7. Overplus; ſomething more than the mere lawful gain.—8. Preponderation on one ſide of the compariſon.

To ADVANTAGE, *v. a.* 1. To benefit.—2. To promote; to bring forward; to gain ground to.

ADVANTAGEABLE, *adj.* profitable; convenient; gainful.

ADVANTAGED, *adj.* poſſeſſed of advantages; commodiouſly ſituated or diſpoſed.

ADVANTAGEOUS, *adj.* profitable; uſeful; opportune; convenient.

ADVANTAGEOUSLY, *adv.* conveniently; opportunely; profitably.

ADVANTAGEOUSNESS, *n. s.* quality of being advantageous; profitableneſs; uſefulneſs; convenience.

To ADVENE, *v. n.* to accede to ſomething; to be ſuperadded.

ADVENIENT, *adj.* advening; coming from outward cauſes; ſuperadded.

ADVENT, *n. s.* the name of one of the holy ſeaſons obſerved by the catholic, the proteſtant epiſcopal, and ſome other chriſtian churches. The word *adventus*, from which it is derived, ſignifies *coming*; that is, the *coming* of our Saviour; which is made the ſebject of devotion during the four weeks before Chriſtmas. The primitive chriſtians practiſed great auſterity during this ſeaſon.

ADVENTINE, *adj.* adventitious; that which is extrinſically added.

ADVENTITIOUS, *adj.* that which advenes; accidental; ſupervenient; extrinſically added.

ADVENTIVE, *n. s.* the thing or perſon that comes from without.

AD VENTREM INSPICIENDUM, in law, a writ by which a woman is to be ſearched whether ſhe be with child by a former huſband, on her with-holding of lands from the next heir, failing iſſue of her own body.

ADVENTUAL, *adj.* relating to the ſeaſon of advent.

ADVENTURE, *n. s.* 1. An accident; a chance; a hazard; an event of which we have no direction.—2. An enterpriſe in which ſomething muſt be left to hazard.

To ADVENTURE, *v. a.* to put into the power of chance.

To ADVENTURE, *v. n.* to try the chance; to dare.

ADVENTURE BAY, in Van Diemen's land. There is a beautiful ſandy beach, about two miles long, at the bottom of Adventure Bay, formed to all appearance by the particles which the ſea waſhes from a fine white ſand ſtone. This beach is very well adapted for hauling a ſeine. Behind it is a plain, with a brackiſh lake, which produces bream and trouts. The parts adjoining the bay are moſtly hilly, and are an entire foreſt of tall trees, rendered allmoſt impaſſable by brakes of fern, ſhrubs, &c. The ſoil on the flat land, and on the lower part of the hills, is ſandy, or conſiſts of a yellowiſh earth, and in ſome parts of a reddiſh clay; but further up the hills, it is of a grey tough caſt. This country, upon the whole, bears many marks of being very dry, and the heat appears to be great. No mineral bodies, nor ſtones of any other kind than the white ſand ſtone, were obſerved by the late navigators; nor could they find any vegetables that afforded ſubſiſtence for man. The foreſt trees are all of one kind, and generally quite ſtraight: they bear cluſters of ſmall white flowers. The principal plants obſerved, are wood-ſorrel, milk-wort, cudweed, bell-flower, gladiolus, ſamphire, and ſeveral kinds of fern: the only quadruped, a ſpecies of opoſſum, about twice the ſize of a large rat. The kangooroo, found further northward in New Holland, may alſo be ſuppoſed to inhabit here, as ſome of the inhabitants had pieces of the ſkin of that animal. The principal birds in the woods are brown hawks or eagles, crows, large pigeons, yellowiſh paroquets, and a ſpecies which they called *motacilla cyanea*, from the beautiful azure colour of its head and neck. On the ſhore were ſeveral gulls, black oyſter-catchers, or ſea-pies, and plovers of a ſtone colour. The inhabitants, who have little of that wild appearance that ſavages in general have, ſeem almoſt totally devoid of perſonal activity or genius, and to be nearly upon a par with the wretched natives of Terra del Fuego. They diſplay, however, ſome ingenuity in their method of cutting their arms and bodies in lines of different directions, raiſed above the ſurface of the ſkin. Their indifference for preſents, their general inattention, and want of curioſity, were very remarkable, and teſtified no acuteneſs of underſtanding. Their complexion is a dull black, which they ſometimes heighten by ſmutting their bodies, as was ſuppoſed, from their leaving a mark behind on any clean ſubſtance. Their hair is perfectly woolly, and is clotted with greaſe and red ochre, like that of the Hottentots. Their noſes are broad and full, and the lower part of the face projects conſiderably. Their eyes are of a moderate ſize, and though they are not very quick or piercing, they give the countenance a frank, cheerful, and pleaſing caſt. Their teeth are not very white, nor well ſet, and their mouths are too wide: they wear their beards long and clotted with paint. They are, upon the whole, well proportioned, though their belly is rather protuberant.

ADVENTURE, BILL OF, in commerce, a writing ſigned by a merchant, teſtifying the goods mentioned in it to be ſhipped on board a certain veſſel belonging to another perſon, who is to run all hazards; the merchant only obliging himſelf to account to him for the produce.

ADVENTURE ISLAND, a ſmall iſland in the South Sea, ſo called from the ſhip Adventure, in which Captain Furneaux, the diſcoverer ſailed. Lon. 130, 31 E. Lat. 43,' 21 S. See ADVENTURE BAY.

ADVENTURER *n. s.* he that ſeeks occaſions of hazard; he that puts himſelf in the hands of chance.

ADVENTURESOME, *adj.* the ſame with *adventurous*.

ADVENTURESOMENESS, *n. s.* the quality of being adventureſome.

ADVENTUROUS, *adj.* he that is inclined to adventures; and, conſequently, bold, daring, and courageous.

ADVENTUROUSLY, *adv.* after an adventurous manner; boldly; daringly.

ADVERB, *n. s.* a word joined to a verb or adjective, and ſolely applied to the uſe of qualifying and reſtraining the latitude of their ſignification, by ſome circumſtance thereof; as, of quality, manner, degree. Thus we ſay, he runs *ſwiftly*; the bird flies *aloft*; he lives *virtuouſly*.

ADVERBIAL, *adj.* that which has the quality or ſtructure of an adverb.

Adverbial Numbers are ſometimes uſed to denote the numerals, *once*, *twice*, *thrice*, &c.

ADVERBIALLY, *adv.* like an adverb; in the manner of an adverb.

ADVERSABLE, *adj.* contrary to; oppoſite to.

ADVERSARIA, *n. s.* a common place; a book to note in.

ADVERSARY, *n. s.* an opponent; antagoniſt; enemy.

ADVERSATIVE, *adj.* a term of grammar, applied to a word which makes ſome oppoſition or variety; as, in this ſentence: *This diamond is orient*, but *it is rough*.—*But* is an *adverſative* conjunction.

ADVERSE, *adj.* 1. Acting with contrary directions; as, two bodies in colliſion.—2. Calamitous; afflictive; pernicious oppoſed to *proſperous*.—3. Perſonally opponent.

Adverse, in logic, is when two contraries have an abſolute and perpetual oppoſition to each other.

ADVERSITY, *n. s.* affliction; calamity; that is oppoſition to our wiſhes.—1. The cauſe of our ſorrow; misfortune.—2. The ſtate of happineſs; miſery.

ADVERSELY, *adv.* in an adverſe manner; oppoſitely; unfortunately.

To ADVERT, *v. n.* to attend to; to regard; to obſerve.

ADVERTENCE, or Advertency, *n. s.* 1. Attention to; regard to; conſideration.—2. Heedfulneſs.

ADVERTENT, *adj.* attentive; vigilant; heedful.

To ADVERTISE, *v. a.* 1. To inform another; to give intelligence.—2. To give notice of any thing in the public prints.

ADVERTISEMENT, *n. s.* 1. Inſtruction; admonition.—2. Intelligence; information.—3. Notice of any thing publiſhed in a paper of intelligence.

Advertisement of Stolen Goods. By the ſtatute of 25 Geo. II. cap. 36. and 28 Geo. II. cap. 19. the penalty of $ 222. is inflicted on perſons advertiſing a reward with no queſtions to be aſked, for the return of things, loſt or ſtollen; and likewiſe on the printer.

ADVERTISER, *n. s.* 1. He that gives intelligence or information.—2. The paper in which advertiſements are publiſhed.

ADVERTISING, or Advertising, *part. adj.* active in giving intelligence; monitory; a word not now in uſe.

To ADVESPERATE, *v. n.* to draw toward evening.

ADVICE, *n. s.* 1. Counſel; inſtruction; except that inſtruction implies ſuperiority, and advice may be given by equals or inferiors.—2. Reflection; prudent conſideration. 3. Conſultation; deliberation.—4. Intelligence.

ADVICE-BOAT, *n. s.* a veſſel employed to bring intelligence.

To ADVIGILATE, *v. n.* to watch diligently.

ADVISABLE, *adj.* prudent; fit to be adviſed.

ADVISABLENESS, *n. s.* the quality of being adviſable, or fit; fitneſs; propriety.

To ADVISE, *v. c.* 1. To counſel.—2. To give information; to inform; to make acquainted with any thing.

To Advise, *v. n.* 1. To conſult: with the particle *with* before the perſon conſulted, as, *be adviſed with his companions*.—2. To conſider; to deliberate.

ADVISED, *part. adj.* 1. Acting with deliberation and deſign; prudent; wiſe.—2. Performed with deliberation; done on purpoſe; acted with deſign.

ADVISEDLY, *adj.* ſoberly; heedfully; deliberately; purpoſely; by deſign; prudently.

ADVISEDNESS, *n. s.* deliberation; cool and prudent procedure.

ADVISEMENT, *n. s.* 1. Counſel; information.—2. prudence and circumſpection. This word is now ſeldom uſed.

ADVISER, *n. s.* the perſon that aviſes, or gives counſel; a counſellor.

ADULA, in ancient geography, a mountain in Rhætia, or the country of the Griſons, part of the Alps, in which are the fountains of the Rhine. It is now called *St. Godbards*.

Adula, in modern geography, a mountain of Navarre, in Spain, lying between Pampeluna and St. Jean de Pie de Port.

ADULATION, *n. s.* flattery; high compliment.

ADULATOR, *n. s.* a flatterer.

ADULATORY, *adj.* flattering; full of compliments.

ADULT, *adj.* grown up; paſt the age of infancy and weakneſs.

Adult, *n. s.* a perſon above the age of infancy, or grown to ſome degree of ſtrength; ſometimes full grown.

ADULTNESS, *n. s.* the ſtate of being adult. See Adolescence.

To ADULTER, *v. a.* to commit adultery with another: a word not claſſical.

ADULTERANT, *n. s.* the perſon or thing which adulterates.

To ADULTERATE, *v. a.* 1. To commit adultery.—2. To corrupt by ſome foreign admixture: to contaminate.

ADULTERATE, *adj.* 1. Tainted with the guilt of adultery.—2. Corrupted with ſome foreign mixture.

ADULTERATENESS, *n. s.* the quality or ſtate of being adulterate, or counterfeit.

ADULTERATION, *n. s.* 1. The act of adulterating or corrupting by foreign mixture; contamination.—2. The ſtate of being adulterated.

Adulteration of coin properly imports the making of it, with too much alloy. Adulterations of coins are effected by forging another ſtamp, by mixing impure metals with the gold or ſilver; and by an undue alloy, or two great an admixture of the baſe metals. Evelyn gives rules both for adulterating and detecting adulterated metals, &c. By the law for eſtabliſhing a mint, perſons debaſing the gold or ſilver coin of the United States, ſhall be deemed guilty of felony, and ſuffer death. See Laws of U. S. 2d Cong. 1ſt Seſſ. c. xvi. § 19.—Adulterating is ſomewhat leſs extenſive than debaſing, which includes diminiſhing, clipping, &c. The ancients puniſhed them with great ſeverity: Among the Egyptians both hands were cut off; and by the civil law, the offender was thrown to wild beaſts. The emperor Tacitus enacted, that counterfeiting the coin ſhould be capital; and under Conſtantine it was made treaſon, as it is alſe in England. Within theſe few years women have been burnt in that country, for coining ſhilling; but this barbarous puniſhment has been lately aboliſhed by an act of parliament.

Adulteration of gems is a curious art, and the methods of detecting is no leſs curious than uſeful; for which ſee Nichol's Lapidary, page 18.

ADULTERER, *n. s.* the perſon guilty of adultery.

ADULTERESS, *n. s.* a woman that commits adultery.

An Adulteress, by the Engliſh law, undergoes no temporal puniſhment whatever, except the loſs of her dower; and ſhe does not loſe even that, if her huſband is weak enough to be reconciled to her, and cohabit with her after the offence is committed. But it is to be obſerved, that adultereſſes are ſuch either by the canon or civil law. According to the former, a woman is an adultereſs who, either being herſelf married, converſes carnally with another man; or being ſingle herſelf, converſes with a man that is married. According to the latter ſhe is not an adultereſs, if ſhe be not herſelf in the married ſtate, though ſhe converſes with a man that is. The crime in this caſe was more properly called *ſtuprum* than *adulterium*. Hence, among the Romans, the word *adultera*, adultereſs, differed from *pellex*, which denoted a ſingle woman who cohabited with a married man: and *pellex* differed from *concubina*, which ſignified her who had only intercourſe with an unmarried man. The former was reputed infamous, and the latter innocent.

ADULTERIA ARBORUM, adulteries of trees, an expreſſion uſed by ancient naturaliſts, for the act of ingrafting one plant upon another. In this ſenſe Pliny ſpeaks of the adulteries of trees, as contrary to nature, and a piece of luxury, or needleſs refinement.

ADULTERINE, *n. s.* a child born of an adultereſs: a term of common law.

ADULTERINE MARRIAGES, in St. Auguſtine's ſenſe, denote ſecond marriages, contracted after a divorce.

ADULTEROUS, *adj.* guilty of adultry.

ADULTERY and Fornication are often uſed ſynonimouſly in ſcripture language; and the former is ſometimes applied in a more extenſive ſenſe, to any ſpecies of impurity or crime, againſt the virtue of chaſtity; and in this ſenſe the divines underſtand the ſeventh commandment.

ADULTERY, ANCIENT PUNISHMENTS OF.—This crime has been puniſhed in moſt ages and nations, though with different degrees of ſeverity. In many it has been capital; in others venal, and only attended with ſlight pecuniary mulcts. Some of the penalties are ſerious and even cruel; others of a jocoſe and humourous kind. Even contrary laws have been enacted as puniſhments for adultery. By ſome the criminals were forbid marrying in caſe they became ſingle; by others they were forbid to marry any beſides each other; by ſome, they have been incapacitated from ever committing the like crime again; by others, they were glutted with it till it became quite nauſeous. Among the Egyptians adultery in the man was puniſhed by 1000 laſhes with rods, and in the woman by the loſs of her noſe. Among the rich Greeks, adulterers were allowed to redeem themſelves by a pecuniary fine; the woman's father, in ſuch caſes, returned the dower he had received from her huſband, which ſome think was refunded by the adulterer. Another puniſhment among thoſe people was, putting out the eyes of adulterers. At Gortyn in Crete, adulterers were covered with wool, an emblem of the ſoftneſs and effeminacy of their diſpoſition, and in that dreſs carried through the city to the magiſtrate's houſe, who ſentenced them to ignominy, whereby they were deprived of all their privileges, and their ſhare in adminiſtering the public buſineſs. The Spartans, indeed, may be ſaid to have tolerated adultery, ſince they laughed at thoſe who thought the violation of the marriage bed an inſupportable affront: they allowed other men the liberty of embracing their wives, which freedom they took with others in their turn. Even ſtrangers, as well as citizens of Sparta, were allowed the ſame freedom with their wives. Yet their kings were exempt from this cuſtom, that the royal blood might be preſerved unmixed. There are various conjectures concerning the ancient puniſhment of adultery among the Romans. Some will have it to have been made capital by a law of Romulus, and again by the twelve tables. Others, that it was firſt made capital by Auguſtus; and others, not before the emperor Conſtantine. The truth is, the puniſhment in early ages was very various, much being left to the diſcretion of the huſband and parents of the adulterous wife; who exerciſed it differently, rather with the ſilence and countenance of the magiſtrate, than by any formal authority from him. Thus we are told, the wife's father was allowed to kill both parties, when caught in the fact, provided he did it immediately, killed both together, and as it were with one blow. The ſame power ordinarily was not indulged the huſband, except the crime were committed with ſome mean or infamous perſon; though, in other caſes, if his rage carried him to put them to death, he was not puniſhed as a murderer. On many occaſions, however, revenge was not carried ſo far; but mutilating, caſtrating, cutting off the ears, noſes, &c. ſerved the turn. The puniſhment allotted by the *lex Julia*, was not, as many have imagined, death; but rather baniſhment, or being interdicted fire and water: though Octavius appears, in ſeveral inſtances, to have gone beyond his own law, and to have put adulterers to death. Under Macrinus, many were burnt at a ſtake. Conſtantine firſt by law made the crime capital. Under Conſtantius and Conſtans, adulterers were burnt, or ſewed in ſacks and thrown into the ſea. Under Leo and Marcian, the penalty was abated to perpetual baniſhment, or cutting off the noſe. Under Juſtinian, a farther mitigation was granted, at leaſt in favour of the wife, who was only to be ſcourged, loſe her dower, and be ſhut up in a monaſtery: after two years the huſband was at liberty to take her back again; if he refuſed, ſhe was ſhaven, and made a nun for life: but it ſtill remained death for the huſband. The reaſon alledged for this difference was, that the woman is the weaker veſſel. Matthæus declaims againſt the empreſs Theodora, who is ſuppoſed to be the cauſe of this law, as well as of others procured in favour of that ſex from the emperor. Under Theodoſius, women convicted of this crime were puniſhed after a very ſingular manner, viz. by a public conſtupration; being locked up in a narrow cell, and forced to admit to their embraces all the men that would offer themſelves. To this end, the gallants were to dreſs themſelves on purpoſe, having ſeveral little bells faſtened to their clothes, the tinkling of which gave notice to thoſe without of every motion. This cuſtom was again aboliſhed by the ſame prince. By the Jewiſh law, adultery was puniſhed by death in both parties, where either the woman was married, or both. The Jews had a particular method of trying an adultereſs, or a woman ſuſpected of the crime, by making her drink the bitter waters of jealouſy: which, if ſhe was guilty made her ſwell. In Spain they puniſhed adultery in men by caſtration, or rather amputation of the offending member. The Saxons formerly burnt the adultereſs, and over her aſhes erected a gibbet, whereon the adulterer was hanged. In England, likewiſe, adultery, by the ancient laws, was ſeverely puniſhed. King Edmund ordered adultery to be puniſhed in the ſame manner as homicide; and Canute ordered that a man who committed adultery ſhould be baniſhed, and that the woman ſhould have her ears and noſe cut off. In the time of Henry I. it was puniſhed with the loſs of eyes and genitals.

Adultery, modern punishments of.—Among the Mingrelians, according to Chardin, adultery is puniſhed with the forfeiture of a hog, which is uſually eaten in good friendſhip between the gallant, the adultereſs, and the cuckold. In ſome of the Indies, it is ſaid, any man's wife is permitted to proſtitute herſelf to him who will give an elephant for the uſe of her; and it is reputed no ſmall glory to her to have been rated ſo high. Adultery is ſaid to be ſo frequent at Ceylon, that there is not a woman who does not practiſe it, notwithſtanding its being puniſhable with death. Among the Japaneſe, and divers other nations, adultery is only penal in the woman. Among the Abyſſinians, the crime of the huſband is ſaid to be only puniſhed on the innocent wife. In the Marian Iſlands, on the contrary, the woman is not puniſhable for adultery; but if the man go aſtray he pays ſeverely; the wife and her relations waſte his lands, turn him out of his houſe, &c. Among the Chineſe there is reaſon to conclude that adultery is not capital; for it is ſaid that fond parents will make a contract with their daughters future huſbands to allow them the indulgence of a gallant. In Britain, adultery is reckoned a ſpiritual offence, and is cognizable by the ſpiritual courts, where it is puniſhed by fine and penance. The common law takes no farther notice of it, than to allow the party grieved an action and damages. This practice is often cenſured by foreigners, as making too light of a crime, the bad conſequences of which, public as well as private, are ſo great. It has been anſwered, that perhaps this penalty, by civil action, is more wiſely calculated to prevent the frequency of the offence, which ought to be the end of all laws, than a ſeverer puniſhment. He that by a judgment of law is, according to circumſtances, ſtripped of great part of his fortune, thrown into priſon till he can pay it, or forced to fly his country, will, no doubt, in ſuch caſes, own that he pays dearly for his pleaſure.

Adultery, moral turpitude of.—Some have vainly endeavoured to explain away the moral turpitude of this crime, by various arguments, and even by an appeal to ſcripture. On the part of the *man* who ſolicits the chaſtity of a married woman, it certainly includes the crime of ſeduction, and is attended with miſchief ſtill more complicated and extenſive: it creates a new ſufferer, the injured huſband, upon whoſe affection is inflicted a wound the moſt painful and incurable that human nature knows. The infidelity of the *woman* is aggrivated by cruelty to her children, who are generally involved in their parent's ſhame, and always made unhappy by their quarrel. It has been argued, that theſe conſequences ought leſs to be attributed to the crime than to the diſcovery. But, in the firſt place, the crime could not be diſcovered unleſs it were committed, and the commiſſion is never ſecure from diſcovery. 2dly, If adulterous connections were allowable whenever the parties could hope to eſcape detection, which is the concluſion to which this argument leads, the huſband would be left no other ſecurity for his wife's chaſtity, than in her want of opportunity and temptation: which would probably deter moſt men from marrying; or render marriage a ſtate of continual jealouſy and alarm to the huſband, which would end in the ſlavery and confinement of the wife. The marriage vow is "witneſſed before God," and accompanied with circumſtances of ſolemnity and religion which approach to the nature of an oath. The married offender, therefore, incurs a crime little ſhort of perjury, and the ſeduction of a married woman is little leſs than ſubornation of perjury: and this guilt is independent of the diſcovery. But the ſtrongeſt apology for adultery is the prior tranſgreſſion of the other party; and ſo far, indeed, as the bad effects of adultery are anticipated by the conduct of the huſband or wife who offends firſt, the guilt of the ſecond offender is extenuated. But this can never amount to a juſtification; unleſs it could be ſhown that the obligation of the marriage vow depends upon the condition of reciprocal fidelity; a conſtruction which appears founded neither in expediency, nor in the terms of the vow, nor the deſign of the legiſlature which preſcribed the marriage rite. To conſider the offence, upon the footing of *provocation*, therefore, can by no means vindicate *retaliation*. "Thou ſhalt not commit adultery," was an interdict delivered by God himſelf: yet ſcripture has been adduced as giving countenance to the crime. As Chriſt told the woman taken in adultery, "Neither do I *condemn thee*," we muſt believe, it is ſaid, that he deemed her conduct either not criminal, or at leaſt not a crime of the heinous nature we repreſent it to be. But from a more attentive examination of the caſe, it will be evident that nothing can be concluded from it favourable to ſuch an opinion. When the ſcribes and phariſees ſtated the law, with the fact, and propoſed the queſtion to our Saviour, "What ſayeſt thou?" it is expreſsly added, "This they ſaid tempting him, that they might have to accuſe him," that is, to draw him into an exerciſe of judicial authority, that they might accuſe him before the Roman governor of uſurping the civil government. This was their deſign; and Chriſt's behaviour proceeded from a knowledge of, and a determination to defeat it. He gives them at firſt a cold and ſullen reception, ſuited to their inſidious intention; "he ſtooped down, and with his finger wrote on the ground, as though he heard them not." "When they *continued* aſking him," when they teaſed him to ſpeak, he diſmiſſed them with a rebuke, which the impertinent malice of their errand, as well as the ſecret character of many of them deſerved: "he that is without ſin, (that is, this ſin) among you, let him firſt caſt a ſtone at her." This had the effect. Stung with the reproof, and diſappointed of their aim, they ſtole away one by one, and left Jeſus and the woman alone. Then follows the converſation, which is the part of the narrative moſt material to our preſent ſubject. "Jeſus ſaith unto her, Woman, where are thoſe thine accuſers? Hath no man condemned thee? She ſaid, No man, Lord. And Jeſus ſaid unto her, Neither do I condemn thee; go and ſin no more." Now when Chriſt aſked the woman, "Hath no man *condemned* thee?" he certainly ſpoke, and was underſtood by the woman to ſpeak, of a legal and judicial condemnation; otherwiſe her anſwer, "No man, Lord," was not true. In every other ſenſe of condemnation, ſuch as blame, cenſure, reproof, private judgment, and the like, many had condemned her; all thoſe, indeed, who brought her to Jeſus. If then a judicial ſentence was what Chriſt meant by *condemning* in the queſtion, the common uſe of language requires us to ſuppoſe that he meant the ſame in his reply, "Neither do I condemn thee;" *i. e.* I pretend to no judicial character or authority over thee; it is no office or buſineſs of mine to pronounce or execute the ſentence of the law. When Chriſt adds, "Go and ſin no more," he in effect tells her that ſhe had ſinned already; but as to the degree or quality of the ſin, or Chriſt's opinion concerning it, nothing is declared, or can be inferred, either way.

ADULTERY, QUESTIONS CONCERNING.—It has been controverted, whether adultery may be lawfully committed in war, with the enemies wives? The anſwer is in the negative, and the authoriſed practice of civilized nations is agreeable to this. It has likewiſe been a diſpute, whether it be lawful for one of the parties married to commit adultery, with the conſent of the other, for the ſake of having children? Of which we have inſtances in Abraham, who, on this account, converſed with Hagar; and likewiſe among the Greeks and Romans. Pollman, a German profeſſor, has a diſſertation on the huſband's right to alienate his wife's body to another's uſe. It is much diſputed, whether adultery diſſolves the bond of matrimony, and be a ſufficient cauſe of divorce, ſo that the parties may marry again. This was allowed in the ancient church, and is ſtill continued in the Greek, as well as the Lutheran and Calviniſt churches. The Catholics, however, diſallow of it, and the council of Trent even anathematized thoſe who maintain it; though the canon of anathematization was mitigated in deference to the republic of Venice, in ſome of whoſe dominions, as Zant, Cephalonia, &c. the contrary uſage obtains. The eccleſiaſtical courts in England ſo far agree with the Papiſts, that they only grant a divorce *a menſa et thoro*, in caſe of adultery; ſo that a complete divorce, to enable the parties to marry again, cannot be had without an act of parliament.

ADULTERY, SPIRITUAL, is uſed in ſcripture, for idolatry, or departing from the true God, to the worſhip of a falſe one. It is alſo uſed, in eccleſiaſtical writers, for a perſon's invading or intruding into a biſhopric during the former biſhop's life. The reaſon of the appellation is, that a biſhop is ſuppoſed to contract a kind of ſpiritual marriage with his church.

ADUMBRANT, *adj.* that which gives ſlight reſemblance.

To ADUMBRATE, *v. a.* to ſhadow out; to give a ſlight likeneſs; to exhibit a faint reſemblance, like that which ſhadows afford of the bodies which they repreſent.

ADUMBRATION, *n. s.* 1. The act of dumbrating, or giving a ſlight and imperfect repreſentation.—2. The ſlight and imperfect repreſenſation of a thing; a faint ſketch.

ADUNATION, *n. s.* the ſtate of being united; union: a word of little uſe.

ADUNCITY, *n. s.* crookedneſs; flexure inwards; hookedneſs.

ADUNCOUS, hooked; crooked.

ADUNQUE, *adj.* crooked; bending inwards; hooked.

ADVOCACY, *n. s.* the act of pleading; vindication; defence; apology: a word of little uſe.

ADVOCATE, *n. s.* 1. He who pleads the cauſe of another in a court of judicature.—2. He that pleads any cauſe, in whatever manner, as a controvertiſt or vindicator.—3. In the ſcriptural and ſacred ſenſe, it ſtands for one of the offices of our Redeemer.

ADVOCATE, among the Romans, a perſon ſkilled in their laws, who undertook the defence of cauſes. The Roman advocates, in the character of pleaders, reſembled the attornies in our courts, and the barriſters of the courts of England; but they never granted counſel, that being the buſineſs of the *juriſconſulti*. The Romans, in the firſt ages of their ſtate, held the profeſſion of an advocate in great honour; and the ſeats of their bar were crowded with ſenators and conſuls; they, whoſe voices commanded the people, thinking it an honour to be employed in defending them gratis. But no ſooner were luxury and corruption introduced into the commonwealth, than the bar became a ſharer in them. Then it was that the ſenators let out their voices for pay, and zeal and eloquence were ſold to the higheſt bidder. To put a ſtop to this abuſe, the tribune Cincius procured a law to be paſſed, called from him *Lex Cincia*, whereby the advocates were forbid to take any money of their clients. They had been prohibited from taking any gratuities for pleading. The emperor Auguſtus added a penalty; notwithſtanding which, the advocates played their part ſo well, that the emperor Claudius thought it an extraordinary circumſtance, when he obliged them not to take above eight great ſeſterces, which are equivalvnt to about $284 for pleading each cauſe.

ADVOCATE, in church hiſtory, a perſon appointed to defend the rights of a church or religious houſe. The word advocatus, or advowee, is ſtill retained for what we uſually call the patron, or him who has the advowſon, or right of preſentation in his own name.

ADVOCATE, in Engliſh courts, is generally called counſel. See COUNSEL.

ADVOCATE, KING'S or LORD ADVOCATE, one of the eight great officers of ſtate in Scotland, who as ſuch ſat in parliament without election. He is the principal crown lawyer in Scotland. His buſineſs is to act as a public proſecutor, and to plead in all cauſes that concern the crown; but particularly ſuch as are of a criminal nature. The office of king's advocate is not very ancient: It ſeems to have been eſtabliſhed about the beginning of the 16th century. Originally he had no power to proſecute crimes without the concurrence of a private party; but, in the year 1597, he was empowered to proſecute crimes at his own inſtance.

ADVOCATES, FACULTY OF, in Scotland, a reſpectable body of lawyers, who plead in all caſes before the courts of Seſſion, Judiciary, and Exchequer. They are alſo entitled to plead in the houſe of peers, and other ſupreme courts in England.—The faculty at preſent conſiſts of 242 members; and as an advocate is eſteemed the genteeleſt profeſſion in Scotland, many gentlemen of fortune take the degree of advocate, without having any intention of practiſing at the bar. This circumſtance greatly increaſes their number, gives dignity to the profeſſion, and enriches their library and public fund. It is from this reſpectable body that all vacancies on the bench are generally ſupplied.

ADVOCATE'S LIBRARY, in the Parliament houſe, Edinburgh. In the year 1660, the faculty founded a library upon a very extenſive plan, ſuggeſted by Sir George M'Kenzie of Roſehaugh, advocate to king Charles II. and king James VII. who enriched it with many valuable books. It has been daily increaſing ſince that time, and now contains not only the beſt collection of law books in Europe, but a very large collection of books on all ſubjects. It alſo contains a great number of original manuſcripts, and a vaſt variety of Jewiſh, Grecian, Roman, Scots, and Engliſh coins and medals.

ADVOCATION, *n. s.* the office or act of pleading; plea; apology.

ADVOCATISSÆ, female advowees. See Advowee.

ADVOLATION, *n. s.* the act of flying to ſomething.

ADVOLUTION, *n. s.* the act of rolling to ſomething.

ADVOWE, *n. s.* he who has the right of advowſon. See Advowson.

ADVOWEE, in ancient law, the advocate of a church, religious houſe, or the like. Ancient writers diſtinguiſh two kinds of eccleſiaſtical advowees. The one, of cauſes or proceſſes *advocati cauſarum*; the other, of territory or lands, *advocati ſoli*. The former were nominated by the king, and were uſually lawyers, who undertook to plead the cauſes of the monaſteries. The other, which ſtill ſubſiſts, and are ſometimes called by their primitive name, advowees, though more uſually patrons, were hereditary; as being the founders and endowers of churches, &c. Women were ſometimes advowees. The canon law mentions ſome who had this title, and who had the ſame right of preſentation, &c. in their churches, which the advowees themſelves had.

ADVOWSON, or Advowzen, *n. s.* in common law, a right to preſent to a benefice.

Advowson, origin of, and its consequences. Though the nomination of fit perſons to officiate in the dioceſes, was originally in the biſhops, yet they were content to let the founders of churches have the nomination of the perſons to the churches ſo founded; and though they formerly reſerved to themſelves a right to judge of their fitneſs, yet this right appears to have been entirely waved for theſe many years; ſo that whatever may be the qualifications of the clergyman propoſed by the advowee or patron to fill a vacant living, he need fear no oppoſition from any eccleſiaſtical ſuperior or tribunal. Were the preſent advowees in Great-Britain and Ireland, actuated by the ſame pious motives, as thoſe which induced their worthy anceſtors to found churches, they would certainly be at greater pains in ſelecting ſuitable perſons to inſtruct men in the great buſineſs of ſalvation; but regardleſs of religion themſelves, they often appoint men to take care of the flocks whoſe ſole object is to obtain the fleece. From this mode of filling up parochial vacancies, it muſt be confeſſed, that though in the eſtabliſhed churches in Great-Britain and Ireland, there are many faithful and pious paſtors, yet there are too many others of a very different deſcription; and this circumſtance has tended greatly to alienate the minds of the people from the eſtabliſhed churches, and to multiply the number of diſſenters, amongſt all denominations of whom the people either mediately or immediately chuſe their own clergy. In Scotland, the right of advowſon is called patronage. See Patronage.

ADVOWTRIE, or Advowtry, *n. s.* adultery.

To ADURE, *v. a.* to burn up: not in uſe.

ADUST, *adj.* 1. Burnt up; hot with fire, ſcorched.—2. It is generally now applied, in a medicinal or philoſophical ſenſe, to the complexion and humours of the body.

ADUSTED, *adj.* 1. Burnt; ſcorched; dried with fire. 2. Hot, as the complexion.

ADUSTIBLE, *adj.* that which may be aduſted, or burnt up.

ADUSTION, *n. s.* the act of burning up, or drying, as by fire.

Adustion, in medicine, is uſed for an inflammation of the parts about the brain, and its membranes, attended with a hollowneſs of the ſinciput and eyes, a pale colour, and dryneſs of the body; in which caſe the yolk of an egg, with oil of roſes, applied by way of cataplaſm, is recommended; as are the leaves of turnſol, the parings of a gourd, the pulp of a pompion, applied in the ſame manner with oil of roſes.

ADY, in natural hiſtory, the palm tree of the Iſland of St. Thomas. It is a tall tree, with a thick, bare, upright ſtem, growing ſingle on its root, of a thin light timber, and full of juice. The head ſhoots into a vaſt number of branches, which being cut off, or an inciſion made therein, afford a great quantity of ſweet juice, which fermenting, ſupplies the place of wine among the Indians. The fruit, which is called *Abanga*, is of the ſize and ſhape of a lemon; and is eat roaſted. The raw kernels are often mixed with mandioc meal, and are ſuppoſed very cordial. An oil is alſo prepared from this fruit, which anſwers the purpoſe of butter, and is likewiſe uſed for anointing ſtiff parts of the body. See Abanga.

ADYTUM, in pagan antiquity, the moſt retired and ſacred place of their temples, into which none but the prieſts were allowed to enter. The *Sanctum Sanctorum* of the temple of Solomon was of the nature of the pagan adytum, none but the high prieſt being admitted into it, and he only once a year.

ADZ, *n. s.* See Addice.

AE, or Æ, a dipthong of the Latin language, which ſeems not properly to have any place in the Engliſh, ſince the *æ* of the Saxons has been long out of uſe, being changed to *e* ſimple, to which in words frequently occurring. the *æ* of the Romans is, in the ſame manner, altered, as in *equator*, *equinoctial*, &c.

ÆBUDÆ. See Hebrides.

ÆDILE, Ædilis, in Roman antiquity, a magiſtrate whoſe buſineſs was to ſuperintend buildings of all kinds, eſpecially public ones, as temples, aqueducts, bridges, &c. to take care of the highways, public places, weights and meaſures, &c. to fix the prices of proviſions, take cognizance of debauches, puniſh lewd women, and ſuch as frequented gaming houſes. They had the inſpection of comedies and other pieces of wit: and were obliged to exhibit magnificent games to the people, at their own expence, whereby many of them were ruined. To them alſo belonged the cuſtody of the plebiſcita, and the examination and cenſure of books. They had the power, on certain occaſions, of iſſuing edicts; and, by degrees, they obtained a conſiderable juriſdiction, the cognizance of various cauſes, &c. All theſe functions, which rendered the ædiles ſo conſiderable, belonged at firſt to the ædiles of the people, ædiles plebeii, or minores: they were only two in number, and were firſt created in the ſame year as the tribunes: for the tribunes, finding themſelves oppreſſed with the multiplicity of affairs, demanded the ſenate to have officers, with whom they might intruſt matters.

matters of leſs importance: and accordingly two ædils were created, and elected every year at the ſame aſſembly as the tribunes. But theſe plebeian ædiles having refuſed, on a particular occaſion, to treat the people with ſhows, as being unable to ſupport the expence, the patricians offered to do it, provided they would admit them to the honours of the ædilate; which being agreed to, two patrician ædiles were created, in the year of Rome, 388; who were called ædiles curules, or majores; as having a right to ſit on a curule chair, enriched with ivory, when they gave audience; whereas the plebeian ædiles only ſat on benches.—Beſides ſharing all the ordinary functions with the plebeians, their chief employ was to procure the celebration of the grand Roman games, and to exhibit comedies, ſhews of gladiators, &c. to the people; and they were alſo appointed judges in all caſes relating to the ſelling or exchanging eſtates. To eaſe theſe four firſt ædiles, Cæſar created a new kind, called ædiles cereales, as deputed chiefly to take care of the corn, which was called *donum Cereris*; for the heathens honoured Ceres as the goddeſs who preſided over corn, and attributed to her the invention of agriculture. Theſe ædiles cereales were alſo taken out of the order of patricians. In the municipal cities there were ædiles, and with the ſame authority as at Rome.

ÆGÆUM Mare. See Ægean Sea.

ÆGEAN Sea, in ancient geography, now the Archipelago, a part of the Mediterranean, which ſeparates Europe from Aſia and Africa; waſhing, on the one hand, Greece and Macedonia; on the other, Caria and Ionia.

ÆGELETHORN, in botany, a name uſed by ſome authers for the common *merculiaris*, or Engliſh mercury, an eatable wild herb.

ÆGIAS, in medicine, a white ſpeck on the pupil of the eye, which occaſions a dimneſs of ſight.

ÆGIDES, a diſorder of the eyes mentioned by Hippocrates, occaſioned by ſmall white cicatrices in the eye, ariſing from an efflux of corroſive humour. See Albuga.

ÆGILOPS, *n. s.* a tumour or great ſwelling in the corner of the eye, by the root of the noſe, either with or without an inflammation.

Ægilops, definition and cure of.—To the above account given of this diſeaſe by Dr. Johnſon, we think it neceſſary to give a more particular deſcription. Authors frequently uſe the words *ægilops*, *anchilops*, and *fiſtula lacbrymalis*, ſynonymouſly; but the more accurate, after Ægineta, make a difference.—The tumor, before it becomes ulcerous, is properly called anchilops; and after it is got into the lachrymal paſſages, and has rendered the *os lacbrymale* carious, fiſtula lachrymalis. If the ægilops be accompanied with an inflammation, it is ſuppoſed to take its riſe from the abundance of blood, which a phlethoric habit diſcharges on the corner of the eye. If it be without an inflammation, it is ſuppoſed to proceed from a viſcous pituitous humour, thrown upon this part. The method of cure is the ſame as that of opthalmia. But before it has reached the lachrymal paſſages, it is managed like other ulcers. If the ægilops be neglected, it burſts, and degenerates into a fiſtula, which eats into the bone.

Ægilops, in botany, the cerrus of holm oak, a ſpecies of Quercus, which ſee.

Ægilops, Wild Festuc; a genus of the monœcia order, belonging to the polygamia claſs of plants, and ranking under the fourth natural order, Gramina.—The characters are: The hermaphrodite calyx is a two-valved glume, triflorous; the coralla a two-valved glume, the exterior valvalet terminated by 3 ariſtæ or awns, the interior awnleſs: Stamina, 3 capillary filaments; ſtyle, 2: Seed, 1. oblong. Male calyx and corolla, each a glume as in the former; and ſtamina, the ſame number.—There are ſeven ſpecies, natives of Italy and ſome other parts of Europe; one of them the ægilops incurvata, a native of Britain, grows by the ſea ſhore, and is vulgarly called ſea hard-graſs. The flour of the ægilops cerris, or feſtuca, has been reputed a remedy for the above-mentioned diſeaſe of the eye.

ÆGIMURUS, in ancient geography, an iſland on the bay of Carthage, about 30 miles diſtant from the city, now the *Galatta*. This iſland being afterwards ſunk into the ſea, 2 of its rocks remained above water, which were called *Aræ*, as mentioned by Virgil, becauſe the Romans and Carthagenians entered into an agreement to ſettle their mutual boundaries at theſe rocks.

ÆGINA, in geography, an iſland on the Saronic Bay, 20 miles diſtant from the Piræeus, formerly vying with Athens for naval power, and at the ſea-fight of Salamis diſputing the palm or victory with the Athenians. The Greeks had a common temple in it dedicated to Jupiter. It was ſurrounded by Attica, the territory of Megara, and the Peloponneſus, each diſtant about 100 ſtadia, or 12 miles and a half. In circumference it was reckoned 180 ſtadia, or 22 miles and a half. It was waſhed on the E. and S. by the Myrtoan and Cretan ſeas.—It is now called *Eyina*, or *Egina*, the *g* ſoft and the *i* ſhort. The temple above-mentioned is ſituated on the ſummit of a mountain called *Panbellenius*, about an hour's walk diſtant from the ſhore. It was of the Doric order, and had ſix columns in front. Twenty-one of the exterior columns are yet ſtanding, with 2 in the front of the pronaos and of the poſticum, and 5 of the number which formed the ranges of the cell. The entablature, except the architrave, is fallen. The ſtone is of a light browniſh colour, much eaten in many places, and indicating a very great age. Some of the columns have been injured by boring to their centres for the metal. In ſeveral, the junction of the parts is ſo exact, that each ſeems to conſiſt of one piece. This ruin Mr. Chandler conſiders as ſcarcely to be parallelled in its claim to a remote antiquity. The ſituation on a lonely mountain, at a diſtance from the ſea, has preſerved it from total demolition, amidſt all the changes and accidents of numerous centuries. Near the ſhore is a barrow, which in the ſecond century, when ſeen by Pauſanias, was ſurrounded with a fence, and had on it a rough ſtone. The terror of ſome dreadful judgment to be inflicted from heaven had preſerved it entire and unaltered to his time; and in a country depopulated and neglected, it may ſtill endure for many ages. The ſoil of this iſland, as deſcribed by Strabo, is very ſtony, eſpecially at the bottom, but in ſome places not unfertile in grain. Beſides corn, it produces olives, grapes, and almonds; and abounds in pigeons and partridges. It has been related, that the Æginetans annually break their eggs, to prevent their multiplying, and occaſioning a famine. They have no hares, foxes, or wolves. The rivers in ſummer are all dry. The vaiwode or governor farms the revenue of the Grand Signior for nearly 7000S. About half this ſum is repaid yearly by the caratch money, or poll-tax.

ÆGINETA, in botany, a genus of plants, belonging to the claſs of didynamia angioſpermia; the characters of which are theſe; the cup is an oval, inflated, and coloured ſpatha; it is univalve, and opens longitudinally near the top. The flower conſiſts of one petal. Its baſe is large, round, and inflated. The tube is ſhort, cylindric, and open; and the mouth is ſmall, but expanded, and turns back at the edge. The ſtamina are 4 crooked filaments; two of them are of the length of the flower, and the other two a little ſhorter. The antheræ are oblong, and ſtand cloſe to one another at their top. The germen of the piſtil is oval; the ſtyle is ſubulated, and of the length of the ſtamina; and the ſtigma is large, round, and bending. The Hortus Malabaricus is the only work in which we have a deſcription of the plant.

ÆGIPHILA, Goat-friend: a genus of the monogynia order, belonging to the tetrandia claſs of plants; the characters of which are: The calyx is a ſingle-leaved perianthium, bell-ſhaped, four-tooth'd, looſe, very ſhort, and perſiſtent: The corolla conſiſts of one petal; the tubus cylindric, narrower and longer than the calyx; the border divided into four ſegments, flat and equal; the diviſion oblong: The ſtamina conſiſt of four erect capillary filaments; the antheræ are incumbent and ſquared: The piſtillum has a germen above; a capillary, two-clift, middle-ſized ſtylus; and a ſimple ſtigma: The pericarpium is a roundiſh unilocular berry: The ſeeds are four. There is only one ſpecies, a native of Martinico.

ÆGIPIROS, in botany, buck-wheat.

ÆGLEFINUS, in ichthyology, a name given by the generality of authors, to the haddock, called by others the *onos*.

ÆGLEUS, in botany, the white chamæleon thiſtle. It is derived from the Greek *aigleis* of Galen; by which he diſtinguiſhes the white chamæleon, which was an eſculent and medicinal plant, from the *erebennus*, which are what we call the black chamæleon thiſtle, and was eſteemed poiſonous.

ÆGLOGUE, *n. s.* [written inſtead of *eclogue*, from a miſtaken etymology.] A paſtoral.

ÆGOPODIUM, small wild Angelica, Goutwort, Goatsfoot, Herb, Gerard, or Ashweed; a genus of the digynia order, belonging to the pentandria claſs of plants; the characters of which are: The univerſal calyx is a manifold convex umbel; the partial one, conſimilar and flat; there is no involucrum; and the proper perianthium is ſcarcely diſcernable: The univerſal corolla is uniform, the floiets all fertile; the proper one five inverſe ovate, concave, equal petals, inflected at the top: The ſtamina conſiſt of five ſimple filaments twice the length of the corolla; the antheræ roundiſh: The piſtillum has a germen beneath; two purple erect ſtili the length of the corrollet; the ſtigmata are headed: No pericarpium: The fruit is ovate, ſtraited, and bipartitite: The ſeeds are two, ovate, on one ſide convex and ſtriated, and flat on the other. There is but one ſpecies, a native of Britain and other parts of Europe. It is very common under hedges and about gardens; the leaves reſemble thoſe of the Angelica, and it carries ſmall white flowers. Its roots run ſo faſt, as to render it a very troubleſome weed.

ÆGOPRICON, a genus of the monœcia order, belonging to the diandria claſs of plants; the characters of which are: The calyx both of the male and female is a tubular perianthium of the leaf divided into three ſegments: Corolla waiting in both: The ſtamina conſiſt of a ſingle erect filament longer than the calyx, with an ovate anthera: The piſtillum has an ovate germen, three divaricated ſtyli, the ſimple perſiſtent ſtigmata: The pericarpium is a globular berry, three grained within, and three celled: The ſeeds are ſolitary, and angular on one ſide.—There is but one ſpecies, a native of Surinam.

ÆGOSPOTAMOS, in ancient geography, a river in the Thracian Cherſoneſus, falling with a ſouth-eaſt courſe into the Helleſpont, to the north of Seſtos.

Ægospotamos, a town, ſtation, or road for ſhips at the mouth of the above river. Here the Athenians, under Conon, through the fault of his colleague Iſocrates, received a ſignal overthrow from the Lacedemonians, under Lyſander, which was followed by the taking of Athens, and put an end to the Peloponneſian war.

ÆREFINUS. See Æglefinus.

ÆGYPT. See Egypt.

ÆGYPTIACA, the Papyrus.

ÆGYPTIACUM, *n. s.* an ointment conſiſting only of honey, verdigreaſe, and vinegar.

Ægyptiacum, in pharmacy, a name given to divers ointments of the detergent, or corroſive kind; ſuch as the black, red, white, ſimple, compound, or magiſtral, Ægyptiacum. The ſimple Ægyptiacum, which is that uſually found in our ſhops, is a compoſition of verdigreaſe, vinegar, and honey, boiled to a conſiſtence. It takes its name from its duſky colour, wherein it reſembles that of the natives of Egypt. It is properly called an unguent; as there is no oil in it. Some call it *Mel Ægyptiacum.* It is chiefly uſed in eating off rotten fleſh, and cleanſing foul ulcers; particular venerial ones in the throat, &c. It alſo deſtroys thoſe cancerous eroſions apt to grow in children's mouths.

ÆHOITULLA, in zoology, the name of an Eaſt Indian ſpecies of ſerpent, found frequently in the iſland of Ceylon; it is very long and ſlender, ſometimes wholly of a fine green, ſometimes green and white, and lives principally on trees, and among buſhes.

ÆIZOON, *n. s. sedum*, houſeleek.

ÆLIUS PONS, now *il Ponte S. Angelo*, a ſtone bridge at Rome, over the Tyber, which leads to the Burgo and Vatican from the city, along Adrian's mole, built by the emperor Adrian.

AELQUAPPE, in zoology, the common name, among the German nations, of a fiſh of the Muſtela kind, the viviparous eelpout, called by Schonefeldt *mustela vivipari.* It is uſually a foot long or more. Its ſkin is perfectly ſmooth, and the colour of its back and head a browniſh yellow, marked with blotches of black; the colour of the back grows paler on the ſides, and on the belly is whitiſh. It has four gills on each ſide, and the head is ſhaped like that of the eel; the back fin reaches the whole length of the body, terminating near the tail. The belly fin begins at the anus, and reaches to the extremity of the fiſh, ending in a fine, ſlender, and ſomewhat reddiſh tail. Beſides theſe, it has two pair of fins, one at the bottom of the gills, which are ſomewhat broad, and the other very fine and ſlender under the throat. The young of this ſpecies are often found alive, to the number of 300 in one individual : they are found of two fingers breadth long, and live ſome time after they are taken out.

ÆNEAS, in fabulous hiſtory, a famous Trojan prince, the ſon of Anchiſes and Venus. At the deſtruction of Troy he bore his aged father on his back, and ſaved him from the Greeks ; but being too ſolicitous about his ſon and houſehold gods, loſt his wife Creuſa in the eſcape. Landing in Africa, he was kindly received by queen Dido, to whom he made a very ungrateful return. Quitting her coaſt, he arrived in Italy, where he married Lavinia, the daughter of king Latinus, and defeated Turnus, to whom ſhe had been contracted. After the death of his father-in-law, he was made king of the Latins, over whom he reigned three years : but joining with the Aborigines, he was ſlain in a battle againſt the Tuſcans. See Æneid.

ÆNEID, the name of Virgil's celebrated epic poem The ſubject, the eſtabliſhment of *Æneas* in Italy, is extremely happy. Nothing could be more intereſting to the Romans, than to look back to their origin from ſo famous a hero. While the object was ſplendid itſelf, the traditionary hiſtory of his country opened intereſting fields to the poet ; and he could glance at all the recent and real great exploits of the Romans, in its ancient and fabulous ſtate. The unity of action is perfectly preſerved in the *Æneid.* The ſettlement of *Æneas*, by the order of the gods, is conſtantly kept in view. The epiſodes are linked properly with the main ſubject. The nodus or intrigue of the poem, is happily managed. The wrath of Juno, who oppoſes *Æneas*, gives riſe to all his difficulties, and connects the human with the celeſtial operations, throughout the whole poem. One great imperfection of the *Æneid*, however, is, that there are almoſt no marked characters in it. Achates, Cloanthes, Gyas, and other Trojan heroes who accompanied *Æneas* into Italy are inſipid. Even *Æneas* himſelf is without intereſt. The character of Dido is the beſt ſupported in the whole *Æneid.* The principal excellency of Virgil is tenderneſs. His ſoul was full of ſenſibility. He muſt have felt himſelf all the affecting circumſtances in the ſcenes he deſcribes ; and he knew how to touch the heart by a ſingle ſtroke. In an epic poem this merit it next to ſublimity. The ſecond book of the *Æneid* is one of the greateſt maſter-pieces that over was executed. The death of old Priam, and the family pieces of *Æneas*, Anchiſes, and Creuſa, are as tender as can be conceived. In the fourth book, the unhappy paſſion and death of Dido are admirable. The epiſodes of Pallas and Evander, of Niſus and Euryalus, of Lauſus and Mezentius, are all ſuperlatively fine. In his battles, Virgil is far ſuperior to Homer. But, in the important Epiſode, the deſcent into hell, he has outdone Homer by many degrees. There is nothing in antiquity, that equals the ſixth book of the *Æneid.*

ÆNGINA, one of the iſlands in the Archipelago. It lies in the bay of Engia, and the town of that name contains about 800 houſes and a caſtle ; and near it are the ruins of a magnificent ſtructure, which was probably a temple.

ÆNIGMA, Ænigmatical. See Enigma, Enigmatical.

ÆNONA, in ancient geography, a city of Liburnia, called by Pliny *Civitas Prasini*, the reaſon of which is unknown ; alſo *Enona* and now *Nona :* on the Adriatic by which it is for the greater part ſurrounded ; over againſt the iſland Giſſa, from which it is diſtant four miles to the weſt. Long. 91. 0. E. Lat. 28. 0. N.

ÆNOS, Ænum, or Ænus, in ancient geograpry, a town of Thrace, ſituated on the eaſtward mouth of the Hebrus. and ſaid to be built by the Cumeans. It was a free town, in which ſtood the tomb of Polydorus. Here the brother of Cato Uticenſis died, and was honoured with a monument of marble in the form of the *Ænii.* Livy ſays that the town was otherwiſe called *Abſynthus.* It is now called *Eno.*

ÆNUS, in ancient geography, now the *Inn*, a river of Germany, which, riſing in the country of the Griſons, out of the Alps, in the diſtrict called Gottes-haus-punt, runs through the county of Tyrol, the Dutchy of Bavaria, and through Paſſau into the Danube.

ÆOLIÆ Insulæ, now *Iſole di Lipari*, in ancient geography, ſeven iſlands, ſituated between Sicly and Italy, ſo called from Æolus, who reigned there about the time of the Trojan war. The Greeks call them *Hephæſtiades ;* and the Romans *Vulcaniæ*, from their fiery eruptions. They are alſo called *Liparæorum Inſulae*, from their principal iſland Lipara. Dionyſius Periegetes calls them *Plutai*, becauſe they are circumnavigable.

ÆOLIAN, Æolic, in grammar, one of the 5 dialects of the Greek tongue. It was firſt uſed in Boetia ; whence it paſſed into Æolia, and was that in which Sappho and Alcæus wrote. The Æolic dialect generally throws out the aſpirate or ſharp ſpirit, and agrees in ſo many things with the Doric, that the two are uſually confounded together.

Æolian lyre. See Acoustics, p. 77, col. 2.

ÆOLIC digamma, is a name given to the letter F, which the Æolians uſed to prefix to words beginning with vowels.

Æolic verse, in proſody, a verſe conſiſting of an iambus, or ſpondee ; then of 2 anapeſts, ſeparated by a long ſyllable ; and, laſtly, of another ſyllable, either long or ſhort, ſuch as, *O ſtellifer conditor orbis.* This is otherwiſe called *eulogic* verſe ; and, from the chief poets who uſed it, *Archilochian* and *Pindaric.*

ÆOLII, or Æoles, the inhabitants of Æolis.

ÆOLIPILA, or Æolipile, in hydraulics, a hollow ball of metal, uſed in the courſes of experimental philoſophy, to demonſtrate the poſſibility of converting water into an elaſtic ſteam or vapour by heat. The inſtrument conſiſts of a ſlender neck or pipe, having a narrow orifice inſerted into the ball by means of a ſhouldered ſcrew. This pipe being taken out, the ball is filled almoſt full of water, the pipe being again ſcrewed in, the ball is placed on a pan of kindled charcoal, where it is well heated, and there iſſues from the orifice a vapour, with prodigious violence and great noiſe, which continues till all the included water is diſcharged. The ſtronger the fire is, the more elaſtic and violent will be the ſteam ; but care muſt be taken that the ſmall orifice of the pipe be not, by any accident, ſtopped up ; becauſe the inſtrument would in that caſe infallibly burſt in pieces, with ſuch violence as might greatly endanger the lives of the perſons near it. Another way of introducing the water is to heat the ball red-hot when empty, which will drive out almoſt all the air ; and then by ſuddenly immerging it in water, the preſſure of the atmoſphere will force in the fluid till it is nearly full. Des Cartes and others have uſed this inſtrument to account for the natural cauſe and generation of the wind. Chauvin ſuggeſts ſome farther uſes of the *Æolipile*.—1. He thinks it might be applied, inſtead of a bellows, to blow the fire, where a very intenſe heat is required. Dr. Lewis condemns ſubſtituting the *Æolipile* inſtead of a bellows, and ſays, that upon trial he always found that inſtead of exciting, it extinguiſhed the fire.—2. If a trumpet, horn, or other ſonorous inſtrument, were fitted to its neck, it might be made to yield muſic. 3. If the neck were turned perpendicularly upwards, and prolonged by a tube or hollow cylinder fitted to it, and a hollow ball laid on the orifice of the tube, the ball would be blown up, and kept fluctuating, or playing up and down, as in the ſtream of a fountain. And 4. It might ſerve to ſcent or fumigate a room, if filled with perfumes, inſtead of common water. An *Æolipile* has been ſometimes placed in a chimney, where it can be heated, the vapour of which ſerves to drive the ſmoke up the chimney. Dr. Piott gives an inſtance where the *Ælopile* is actually uſed to blow the fire: the lord of the manor of Effingham is bound by his tenure to drive a gooſe every New-Year's day three times round the hall of the lord of Hilton, while Jack of Hilton (a brazen figure having the ſtructure of an *Æolipile*) blows the fire. In Italy it is ſaid, that the *Æolipile* is commonly made uſe of to cure ſmoaky chimnies; for being hung over the fire, the blaſt ariſing from it carries up the loitering ſmoke along with it. Some authors have diſcovered a ſtill more extraordinary uſe, to which the frauds of the heathen prieſthood applied the *Æolipile*, viz. the working of ſham miracles. Beſides Jack of Hilton, which had been an ancient Saxon idol, Mr. Weber ſhews, that *Pluster*, a celebrated German Idol, is alſo of the *Æolipile* kind; and in virtue thereof, could do noble feats; being filled with a fluid, and thus ſet on the fire, it would be covered with ſweat; and as the heat encreaſed, would at length burſt out into flames.

ÆOLIS, or **Æolia**, in ancient Geography, a country of Aſia, ſettled by colonies of Æolian Greeks. At large, it comprehended all Troas, and the courſe of the Helleſpont to the Propontis, becauſe in thoſe parts there are ſeveral Æolian colonies: more ſtrictly, it was ſituated between Troas to the north, and Ionia to the ſouth.

ÆOLIUM mare, in ancient geography, the Æolian Sea, a part of the Egean Sea, waſhing Æolis; called alſo *Mysium*, from Myſia; now called, *Golfo di Smyrna*.

ÆOLUS, in mechanics, a portable machine, invented by Mr. Tidd, for refreſhing and changing the air in rooms. This machine is adapted in its dimenſions to ſupply the place of a ſquare of glaſs in a ſaſh window, and is executed in ſo ſmall a compaſs, as to project but a little way from the ſaſh, and in ſo neat a manner, ſays the inventor, as to be an elegant ornament to the place where it is fixed. It works without the leaſt noiſe, requires no attendance, and occaſions neither trouble nor expence to keep it in order. It throws in only ſuch a quantity of air as is agreeable; and leaves off working of its own accord, whenever the door or window is opened.

ÆON, in anatomy, the ſpinal marrow.

ÆRA, a fixed point of time from whence any number of years is begun to be counted. It is ſometimes alſo written in ancient authors *Era*. The term has very improperly been confounded with epocha; an *æra* properly comprehending a large portion of time, a ſucceſſion of years, whilſt an *epocha* points out the preciſe time, at which an æra commences. Thus the epocha of the building of Rome, commences the æra of the Roman people; the birth of Chriſt is the epocha of the Chriſtian æra, and the 4th of July 1776, is the epocha of American Independence, as the preſent year (1802) is the 26th year of their æra. All nations, who have advanced ſo far in civilization, as the cultivation of letters, have each formed their own æra, which, however, has, in ſome nations, been frequently varied: thus, the Chineſe have ſeveral æras, and the Aſiatics divide time into four ſeveral æras, which correſpond with the poetical ages. See Joug. The French nation has fixed the commencement of their republican æra, on the 22d of September, 1792, in commemoration of their having on that day pronounced the abolition of royalty. The origin of the term is conteſted, though it is generally allowed to have had its riſe in Spain. Sepulveda ſuppoſes it formed from A. ER. A. the notæ or abreviatures of the words, *annus erat Augusti*, occaſioned by the Spaniards beginning their computation from the time their country came under the dominion of Auguſtus, or that of receiving the Roman Caledar. This opinion, however ingenious, is rejected by Scaliger, becauſe in the ancient abbreviatures *A* never ſtood for *annus*, unleſs when preceded by *V* for *vixit*; and it ſeems improbable they ſhould put ER for *erat*, and the letter A, without any diſcrimination, both for *annus* and *Augustus*. Voſſius nevertheleſs favours the conjecture, and judges it at leaſt as probable, as either that of Iſidore, who derives *æra* from *æs*; the tribute money, wherewith Auguſtus taxed the world; or that of Scaliger himſelf, who deduces it likewiſe from *æs*; which he obſerves, was uſed among the ancients for an *article* in an account; and hence it came alſo to ſtand for a ſum or number itſelf. From the plural *æra*, came by corruption *æra*, *æram*, in the ſingular; as *Ostia*, *Ostiam*, the name of a place, from *Ostia*, the mouths of the Tyber.

Æra, in botany, cockle or darnel.

Æra, the Chriſtian. It is generally allowed by Chronologers, that the computation of time from the birth of Chriſt was not introduced till the ſixth century, in the reign of Juſtinian, and is commonly aſcribed to Dionyſius Exiguus. This computation then came in uſe in deeds, &c. before which time either the Olympiads, the year of Rome, or that of the reign of the emperors, were uſed.

ÆRARIUM, the public treaſury of the Roman State. The temple of Saturn at Rome, being the great treaſury of the ſtate, was firſt called ærarium; from *æs*, *æris*, copper; that being the only money in uſe before the year of Rome 485, when ſilver began to be coined.

AERIA, or **Eeria**, In ancient geography. Theſſaly, Egypt, or Ethiopia. The ſcholiaſt on Appolonius Rhodius, ſays, that not only Theſſaly, but Egypt, was called *Aeria* by the Greeks, which Euſebius confirms: and hence Apollinarius, in his tranſlation of the 114th Pſalm, uſes it for Egypt. Heſychius applies this name to Ethiopia.

AERIAL, *adj.* 1. Belonging to the air, as conſiſting of it.—2. Produced by the air.—3. Inhabiting the air.—4. Placed in the air.—5. High; elevated in ſituation, and therefore in the air.

Aerial Perspective, is that which repreſents bodies weakened and diminiſhed, in proportion to their diſtance from the eye. It chiefly reſpects the colours of objects, whoſe force and luſtre it takes off more or leſs, to make them appear as if more or leſs remote. The reaſon is, that the longer column of air an object is ſeen through, the more feebly do the viſual rays emitted from it affect the eye.

AERIANS, in church hiſtory, a branch of Arians, who, to the doctrines of that ſect, added ſome peculiar dogmas of their own; as, that there is a difference between biſhops and prieſts. The ſect received its denomination from Aerius, who founded his doctrine chiefly upon ſome paſſages in St. Paul; and, among others, upon that in 1 Tim. iv. 14, where the apoſtle exhorts him not to neglect "the gift he had received by the laying on of the hands of the Preſbytery." Here, obſerves Aerius, are no mention of biſhops: on the contrary, Timothy evidently received his ordination from the preſbyters or prieſts. Epiphanius zealouſly maintains the ſuperiority of biſhops againſt the Aerians. The word *preſbytery*, uſed by the apoſtle, he obſerves, includes both biſhops and prieſts; the whole ſenate or aſſembly of the eccleſiaſtics of the place.

AEROGRAPHY, a deſcription of the air, or atmoſphere, its limits, dimenſions, properties, &c. This amounts to much the ſame with aerology, unleſs we ſuppoſe the latter to enter into the rational, and the former to confine itſelf to a deſcription of the more obvious affections thereof. See ATMOSPHERE.

AEROLOGICA, that branch of medicine, called by ſome *diſoſtica* or the *non-naturals*, which treats of air, its properties and uſe in the animal œconomy, and its efficacy in preſerving and reſtoring health.

AEROLOGY, *n. s.* (derived from the two Greek words *aer*, the air, and *logos*, a diſcourſe,) the doctrine of the air.

AEROLOGY.

AEROLOGY, or the ſcience of AIR, comprehends the nature of that element, its various ſpecies, with the knowledge of their conſtituent parts, properties, operations, phænomena and uſes.

AIR is that inviſible fluid, which every where ſurrounds the terraqueous globe, and which appears to be one of the great agents of nature, in the œconomy of the world; as without it neither animal nor vegetable life can exiſt for any time. Although philoſophers in all ages have been more or leſs employed in inveſtigating the nature of the elements in general, and of the atmoſphere in particular, yet till of late, little more than the mere mechanical action of this fluid, with the exiſtence of ſome anomalous elaſtic vapours in it, was known. Within theſe laſt 40 years, however, the diſcoveries concerning the conſtituent parts of the atmoſphere itſelf, as well as the nature of the different permanently elaſtic fluids which go under the general name of *air*, have been ſo numerous and rapid, that they have at once raiſed this ſubject to the dignity of a *Science*; and one by which many perplexing proceſſes in chemiſtry have been explained, ſeveral facilitated, and a number of new and uſeful ones introduced. The phenomena attending metallic calcinations and reductions have been greatly elucidated; and the knowledge of the uſe of the air in reſpiration, the method of aſcertaining its purity and fitneſs for that function, the inveſtigation of dephlogiſticated air, are all calculated to anſwer purpoſes of the higheſt utility.

CHAP. I. *Of the* GENERAL CONSTITUTION, MECHANICAL PROPERTIES, *and* OPERATIONS *of the* AIR.

1. *The General Conſtitution of the Air we Breathe.*

The atmoſpheric air, or the air we breathe, has been, in all ages, till the preſent, ſuppoſed to be ſimple and homogeneous, and its common operations to depend on its heat, cold, moiſture, or dryneſs; but it is, in fact, the receptacle of all kinds of effluvia produced from terreſtrial or marine ſubſtances, either naturally or artificially. Hence, whatever may be its nature when abſolutely pure, the air which we breathe, muſt be conſidered as an exceedingly heterogeneous mixture.

Providentially however it happens, that there are various ways in which the atmoſphere undergoes a kind of ſpontaneous purification. One of the moſt prevalent cauſes of this is the moſt incredible quantity of aqueous vapour, which according to Dr. Halley, Dr. Watſon, and other philoſophers, is continually diffuſed through it; and which, in aſcending from the earth, effects this ſalutary purpoſe. But it had been diſcovered alſo, that thoſe parts of the atmoſphere which are unfavourable to animal life, conſtitute the principal nouriſhment of the vegetable world. Hence very probably, not only the phlogiſtic vapours which aſcend becauſe of their leſs ſpecific gravity, but alſo thoſe metalline and other deleterious exhalations, which would otherwiſe reſt upon the earth's ſurface, are imbibed by the vegetable productions which every where abound; and which alſo have the property of emitting *pure* air (under certain circumſtances) in return for that which they have conſumed.

2. *Mechanical Properties of the Air.*

The two moſt important properties of the atmoſpheric air, are its gravity and its elaſticity. The firſt compared to the ſpecific gravity of water, according to the computations of Mr. Boyle, is as 1 to 938, but, according to later experiments, as 1 to 800. This property is rendered evident in a variety of ways, but in none more deciſively than in ſimply evacuating the receiver of an air pump, ſo as to evince the prodigious preſſure of the atmoſphere on its outſide. M. Paſcal has computed the quantity of this preſſure on the earths ſurface to be upwards of 2232 lb. on every ſquare foot.

On the GRAVITY of the air depend the aſcent of water in pumps, ſyphons, &c. and likewiſe all the phenomena of the barometer. But beſides gravity, which the air has in common with other fluids, there is another property which ſeems to be peculiar to it. For although ſteam or vapour poſſeſſes this property, it appears to belong to it only as an aerial fluid, and not as an aqueous one. This is its ELASTICITY, by which it can be compreſſed, into a ſmaller bulk, but returns like a ſpring, to its original ſize, immediately upon removing the preſſure.

The elaſticity of the air, which was firſt aſcertained by ſome experiments of Lord Bacon, is no leſs eaſy of proof than its gravity. If a ſhrivelled bladder containing only a very ſmall quantity of air be put under the receiver of an air pump, and the preſſure of the atmoſphere taken off the outſide of the bladder, by exhauſting the receiver, the elaſticity of the air within will be ſhewn by its expanding the bladder to its full dimenſions. The ſame fact is ſhewn in a variety of experiments not neceſſary to be detailed here. It may be proper however to obſerve, that this elaſticity is capable of ſome diminution by long continued and violent preſſure.

The weight or preſſure of the air has no dependence on its elaſticity, but would be the ſame whether it had ſuch a property or not. The air, however, being elaſtic, is neceſſarily affected by the preſſure, which reduces it into ſuch a ſpace, that the elaſticity which re-acts againſt the compreſſing weight, is equal to that weight. In fact, the law of this elaſticity is, that it increaſes as the denſity of the air increaſes; and the denſity increaſes as the force increaſes by which it is preſſed. Now there muſt neceſſarily be a balance between the action and re-action; i. e. the gravity of the air which tends to compreſs it, and the elaſticity by which it endeavours to expand muſt be equal. Hence the elaſticity increaſing or diminiſhing univerſally, as the denſity increaſes or diminiſhes, it is no matter whether the air be compreſſed and retained in ſuch a ſpace by the weight of the atmoſphere, or by any other means; it muſt endeavour in either caſe to expand with the ſame force. And hence, if air near the earth be pent up in a veſſel, and all communication with the external fluid cut off, the preſſure of the incloſed air will be equal to the weight of the atmoſphere at the time the quantity was confined. Accordingly, we find mercury ſuſtained to the ſame height, by the elaſtic force of air confined in a glaſs veſſel, as by the whole atmoſpherical preſſure. On the ſame principle air, may be artificially condenſed; and hence the ſtructure of the AIR-GUN.

The utmoſt limits of which air, of the denſity which it poſſeſſes at the ſurface of the earth, is capable of being compreſſed, have not been aſcertained. Dr. Hales, by means of a preſs, condenſed it 38 times; and afterwards, by forcing water in an iron globe, into 1551 times leſs ſpace than it naturally occupies. However, Dr. Halley, from the experiments made at London and Florence, concludes, that no force whatever is able to reduce air into 800 times leſs ſpace than that which it naturally poſſeſſes on the ſurface of our earth. The dilatation of the air, however, by virtue of its elaſtic force, is found to be very ſurpriſing. In the experiments made by Mr. Boyle, it dilated into 10,000, and even at laſt into 13,679 times its ſpace; and this altogether by its own expanſive force, without the help of fire. In fact, it appears, that the air we breathe is compreſſed by its own weight, into at leaſt the 13,679th part of the ſpace it would poſſeſs *in vacuo*. But if the ſame air be condenſed by art, the ſpace it will take up when moſt dilated, to that it poſſeſſes when condenſed, will be, according to the ſame author's experiments, as 550,000 to 1. Dr. Hales found, that the air in a retort, when the bottom of the veſſel was juſt beginning to be red hot, was expanded through twice its former ſpace: But Mr. Robins found it was expanded by the heat of iron, firſt beginning to be white, to four times the former bulk.

The elaſtic power of the air is the ſecond great ſource of the effects of the important fluid. Thus it enters the pores of bodies: and by this prodigious faculty of expanding, which is ſo eaſily excited, puts their particles into perpetual oſcillations. Indeed, the degree of heat, and the air's gravity and denſity, and conſequently its elaſticity and expanſion, never remaining the ſame, for the leaſt ſpace of time, there muſt be an inceſſant vibration, or dilation and contraction in all bodies. From this cauſe it is, that the air contained in bubbles of ice, by its continual action burſts the ice. Thus alſo entire columns of marble ſometimes are cleft, in winter time, from the increaſed elaſticity of ſome little bubble of air contained in them. From the ſame principle ariſe all putrefaction and fermentation; neither of which will proceed, in the beſt diſpoſed ſubjects, *in vacuo*.

3. *Effects of the Different Ingredients of Air.*

Beſides theſe properties of gravity and elaſticity, authors have attributed to air ſeveral qualities, which rather belong to the accidental mixture of other fluids in its compoſition. Of this nature is its property of corroding metals, ſtones, &c. but we ſhall not dwell on them at preſent, farther than to obſerve, that in theſe caſes the diſſolving power of the air is increaſed by heat, and by other cauſes. It combines with water; and, by acceſs of cold, depoſits part of the matter which was kept diſſolved in it by a greater degree of heat. Hence the water, by being depoſited and condenſed upon any cold body, ſuch as glaſs, &c. in windows, forms fogs, and becomes viſible.

In the operations of chemiſtry, air is a very import[illegible] agent; the reſult of particular proceſſes depending on its preſence or abſence, on its being open or incloſed. Thus, the parts of animals and vegetables can only be calcined in open air; in cloſe veſſels they never become any other than black coals. And theſe operations are effected by the changes to which the air is liable. Many inſtances might be adduced to this purpoſe. Let it ſuffice to obſerve, that it is very difficult to procure oil of ſulphur, *per campanam*, in a clear dry atmoſphere; but in a thick moiſt air it may be obtained with greater eaſe, and in larger quantities. So, pure well fermented wine, if it be carried to a place [illegible] the air is repleniſhed with the fumes of new wine [illegible] fermenting, will begin to ferment afreſh. The cha[illegible] air ariſe from various cauſes, and are obſervable, [illegible] in its mechanical properties, but in the ingre[illegible] compoſe it. Thus, at Faſhlun, noted for copper [illegible] mineral exhalations affect the air, in ſuch a m[illegible] to diſcolour the ſilver coin in purſes, and change the [illegible]lour of braſs. In Campania, &c. where are [illegible] ſulphur, the air ſometimes becomes very unwhole[illegible] which occaſions frequent epidemic diſeaſes, &c. The [illegible]via of animals alſo have their effect in varying the air; as is

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evident in contagious diſeaſes, plagues, murrains, and other mortalities, which are ſpread by an infected air.

Of the ſucceſſive diſcoveries relative to atmoſpheric and other aerial fluids, we might here give a hiſtorical account, were it not more our object to detail facts than the circumſtances under which they were diſcovered. We ſhall however briefly obſerve, that Van Helmont was the firſt who made diſcoveries on this important ſubject. Mr. Boyle followed his ſteps; and after him Dr. Hales, and Profeſſor Venel, contributed to the advancement of this important branch of philoſophy. But their diſcoveries at length were greatly eclipſed by the modern chemiſts, Dr. Black, Mr. Cavendiſh, and Dr. Prieſtley; but particularly the latter, to whom it was reſerved, to prove by the moſt deciſive teſts, the compoſition and nature of our atmoſphere, which appears to be compoſed of two fluids; the one abſolutely noxious, and incapable of ſupporting animal life for a moment; the other extremely ſalutary, and capable of preſerving animals alive and healthy for a much longer time than the pureſt air we can meet with. We now proceed to give an account of the different kinds of aerial fluids, beginning with thoſe which are known, or ſuppoſed, to conſtitute a part of our atmoſphere.

CHAP. II. *Of* DEPHLOGISTICATED *or* PURE AIR.

I. *Diſcovery and methods of procuring this kind of Air.*

Pure air was firſt obtained by Dr. Prieſtley, in 1774, and he called it *dephlogiſticated*, from his opinion, that common air, in the act of burning, abſorbs phlogiſton. In the courſe of his enquiries, he fell upon a method of extracting it from a variety of ſubſtances, viz. by moiſtening them with ſpirit of nitre, and then diſtilling them with a ſtrong heat. Thus, he obtained it from flowers of zinc, chalk, quicklime, ſlacked lime, tobacco-pipe clay, flint, Muſcovy talcs, and even glaſs. He then found, that by ſimply diſſolving any metal in the nitrous acid, and then diſtilling the ſolution, he could obtain very pure air: and Mr. Warltire found even the trouble of diſtillation unneceſſary; nothing more being requiſite than to moiſten red lead with the ſpirit of nitre, and then pour upon it the oil of vitriol, which inſtantly diſengaged the dephlogiſticated air, without applying any more heat than what was generated by the mixture.

Mr. Scheele, without knowing of Dr. Prieſtley's diſcovery, fell upon a method by which pure air may be ſtill more readily procured, viz. by the diſtillation of nitre with a ſtrong heat; by which means it may be obtained in a very conſiderable quantity, and in as great purity as by the more expenſive proceſſes. It appears however, that the mode of applying heat has alſo a very conſiderable effect on the quantity of air produced. Dr. Prieſtley remarks, that "from equal quantities of red lead, without any mixture of ſpirit of nitre, and uſing the ſame apparatus for diſtilling it, he obtained, by means of heat applied ſuddenly, more air than when ſlowly applied, in the proportion of ten to ſix. The proportion of fixed air was the ſame in both caſes, and the remainder equally dephlogiſticated."

The doctor found, further, that by heat alone, ſedative ſalt, mangaueſe, lapis calaminaris, and the mineral called *lapis ponderoſus*, *wolfrant* or *tungſten*, would yield dephlogiſticated air; the firſt indeed, in very ſmall quantity, and ſometimes even of a quality very little ſuperior to common air: In theſe experiments, he made uſe of ſmall bellied retorts of green glaſs, which can ſtand the fire beſt, containing about an ounce of water, and having narrow necks, 18 or 20 inches long. The ſubſtance to be examined was put into a retort of this kind, and then expoſed to a red heat either in ſand or over a naked fire, while the neck of the veſſel was plunged in water or mercury. Having diſſolved ſix pennyweights of very clean iron in oil of vitriol, and then diſtilled the ſolution to dryneſs in a long necked retort, he received the common air a little phlogiſticated, ſome fixed air, much vitriolic acid air, and laſtly, 18 ounce meaſures of dephlogiſticated air. The iron that remained undiſſolved weighed 23 grains, ſo that the air was yielded by 5 penny weights and 1 grain of iron. The ochre weighed 7 penny weights 13 grains; ſo that, ſays he, there probably remained a quantity of oil of vitriol in it; and conſequently, had the heat been greater, more air would have been obtained.

Dr. Prieſtley having conſtantly found, in his experiments with the nitrous acid, that by pouring freſh nitrous acid on the reſiduum, and repeating the operation, more dephlogiſticated air might be obtained, he determined to try whether the ſame would not hold good with vitriolic acid alſo. For this purpoſe, he added more oil of vitriol to the reſiduum of the laſt mentioned experiment. When in a red heat with a glaſs retort, it yielded a quantity of vitriolic acid air, no fixed air, but about 24 ounce meaſures of dephlogiſticated air; when the retort being melted, a good deal of the air was neceſſarily loſt; but on reſuming the proceſs in a gun barrel, he procured as much air as had been got before. The reſult of theſe, and innumerable other experiments made by philoſophers in different countries, was, that dephlogiſticated air may be obtained from a vaſt variety of mineral and metallic ſubſtances, by means of the vitriolic and nitrous acids.

It now remained, only to diſcover in what manner this fluid, ſo eſſentially neceſſary to the ſupport of animal life, is naturally produced in quantities ſufficient for the great expence of it throughout the whole world, by the breathing of animals, the ſupport of fires, &c. This diſcovery, indeed, had been made before even the exiſtence of dephlogiſticated air itſelf was known. Dr. Prieſtley, after having tried various methods of purifying contaminated air unſucceſsfully, found at laſt, that ſome kinds of vegetables, but particularly mint, anſwered this purpoſe very effectually. Having rendered a quantity of air thoroughly noxious, by mice breathing and dying in it, he divided it into two receivers inverted in water, introducing a ſprig of mint into one of them, and keeping the other receiver unaltered. About 8 or 9 days after, he found that the air of the receiver into which he had introduced the ſprig had become reſpirable; for a mouſe lived very well in this, whereas it died the moment it was put into the other.—From theſe experiments, he at firſt concluded, that in all caſes the air was meliorated by the vegetation of plants: but ſome experiments of this kind did not anſwer ſo well towards the end of the year as they had done in the hot ſeaſon; and a ſecond courſe ſeemed to be almoſt entirely contrary to the former. At the time of making theſe experiments, he ſuppoſed that the air was meliorated merely by the abſorption of phlogiſton from that which had been tainted; but the experiments of Dr. Ingenhouſz, in 1779, ſhewed that this was accompliſhed, not only by the abſorption juſt mentioned, but alſo by the *emiſſion* of dephlogiſticated air. He obſerves in general, that plants have a power of correcting bad air, and even of improving common air in a few hours, when expoſed to the light of the ſun: but, in the night-time, or when they are not influenced by the ſolar rays, they contaminate the air.

This property, however, does not belong in an equal degree to all kinds of plants: nor is it poſſible to diſcover by the external properties of a plant, whether it be fit for this purpoſe or not. Air phlogiſticated by breathing, and in which a candle could not burn, after being expoſed to the ſun for three hours, with a ſprig of peppermint in it, was ſo far corrected, as to be again capable of ſupporting flame. The following experiment, made with a muſtard plant, may be looked upon as deciſive: A plant of this kind was put into a glaſs receiver containing common air, and its ſtem cut off even with the mouth of the receiver. The veſſel was then inverted in an earthen pan, containing ſome water to keep the plant alive, and the whole apparatus was ſet over night in a room. Next morning the air was found ſo much contaminated, that it extinguiſhed the flame of a wax taper. On expoſing the apparatus to the ſun for a quarter of an hour, the air was found to be ſomewhat corrected; and after an hour and an half, it was ſo far improved, that by the teſt of nitrous air it appeared conſiderably better than common air.

Among the diſcoveries to which theſe experiments led, was that of procuring pure air from pump water, which had ſtood till a green matter had extended itſelf over the bottom and ſides of the veſſel containing it. Water, in this ſituation, emits pure air very copiouſly, and that even when the green matter exhibits ſigns of decay, and becomes yellowiſh; but the light of the ſun, it appears, is eſſential to this proceſs; very little pure air being emitted in the dark.—An improvement on this idea was ſoon afterwards ſuggeſted by Dr. Ingenhouſz, who procured pure air very readily from the leaves of different vegetables, ſome of them of the poiſonous kind, but more eſpecially from aquatic plants, the turpentine trees, and the green matter collected from a ſtone trough. The purity of this dephlogiſticated air was equal, if not ſuperior, to that procured by the beſt chemical proceſſes; as it ſometimes required eight times its own quantity of nitrous air to ſaturate it. All parts of the plants were not found equally proper for the production of it; the full grown leaves yielded it in greateſt quantity and purity, eſpecially from their under ſurface. It was alſo procured from the green ſtalks.—One hundred leaves of *Naſturtium Indicum*, put into a jar holding a gallon, filled with ordinary pump water, and expoſed to the ſun from 10 to 12 o'clock, yielded as much air as filled a cylindrical jar four inches and an half in length, and one and three quarters in breadth. On removing this quantity of air, and expoſing them again to the ſun till 7 o'clock, about half as much was produced, of a quality ſtill ſuperior to the former; and next morning by 11 o'clock they yielded as much more of an equal quality. The roots of plants, he ſays, when kept out of ground, generally yield bad air, and at all times, contaminate common air, a few only excepted.—Flowers and fruits, in general, yield a very ſmall quantity of noxious air, but contaminate a great quantity of common air at all times, eſpecially in the night, and when kept in the dark. Two dozen of young and ſmall French beans, kept in a quart jar of common air for a ſingle night, contaminated the air to ſuch a degree, that a very lively chicken died by being confined in it leſs than half a minute.

That the vegetation of plants is one of the great means employed by nature to purify the atmoſphere, ſo as to counteract, in a great meaſure, the damage done by animal reſpiration, combuſtion, &c. is evident from theſe experiments. It may only be ſaid, that vegetation does not appear to be ſufficient to remedy entirely that damage. The power of vegetables, in yielding dephlogiſticated air, begins a few hours after the ſun has made its appearance in the horizon, or rather after it has paſſed the meridian, and ceaſes with the cloſe of the day; excepting ſome plants which continue it a ſhort time after ſun-ſet. The quantity of dephlogiſticated air, in general, is greater in a clear day than when it is cloudy. It is alſo greater when the plants are expoſed to the ſun, than when they are ſituated in ſhady places. The damage, done by plants in the night, is alſo more than counterbalanced by the benefit they afford in the day time. "By a rough calculation, (ſays Dr. I.) I found the poiſonous air, yielded by any plant during the whole night, could not amount to one hundredth part of the dephlogiſticated air which the ſame plant yielded in two hours time in a fair day." It does not appear, however, that plants yield dephlogiſticated air by any kind of generation of that fluid, but only by filtrating the common air, which all plants abſord through their pores; the phlogiſtic part becoming part of their ſubſtance, and probably being the true vegetable food. Dry plants have little or no effect upon the air until they are moiſtened.—On all theſe experiments, however, it muſt be obſerved, that they have ſometimes failed in the hands of thoſe whom we cannot but ſuppoſe very capable of trying them; as M. Scheele, Mr. Cavallo, and the Abbe Fountana.

The reſult of Dr. Ingenhouſz's experiments, however, was rendered dubious by thoſe of Sir Benjamin Thomſon, of Maſſachuſetts, commonly called Count Rumford, in which the green matter ſuppoſed to be vegetable, was ſhewn to conſiſt of a number of animalculæ. He obſerved further, that ſeveral animal ſubſtances, as well as vegetables, have a power of ſeparating dephlogiſticated air from water, when expoſed to the light of the ſun, and that for a very great length of time. Not that the ſame quantity of water will always continue to furniſh air; but the ſame animal ſubſtance being taken out, waſhed, and again put into freſh water, ſeems to yield dephlogiſticated air, without any kind of limitation. Raw ſilk was the ſubſtance, on which his experiments were firſt attempted; and he not only found that it was capable of yielding pure air in a conſiderable quantity, when placed in the ſame circumſtances with the leaves of plants, but alſo that the light, (no leſs required to produce dephlogiſticated air from animal than vegetable ſubſtances,) was not, in either caſe, neceſſarily that of the *ſun;* though indeed the pure air was more ſparingly ſupplied, under the influence of artificial light, than in the other caſe. In making the experiments, as it was found ſomewhat troubleſome to invert the globes in water, they were at laſt only kept in an inclined poſture on the table. See PNEUMATICS, the eaſieſt method of procuring dephlogiſticated air.

Sir Benjamin having provided himſelf with a number of globes of different ſizes, he proceeded in the following manner:

eral. Another ſtrong argument in favour of this opinion is, that dephlogiſticated air yields no nitrous acid when phlogiſticated by liver of ſulphur; for if this air contains nitrous acid, and yields it when phlogiſticated by exploſion with inflammable air, it is very extraordinary that it ſhould not do ſo by other means. But what forms a ſtronger, and, I think, almoſt deciſive argument in favour of this explanation, is, that when the dephlogiſticated air is very pure, the condenſed liquor is made much more ſtrongly acid, by mixing the air to be exploded with a little phlogiſticated air."

In a word, Dr. Prieſtley's opinions on the component parts of this ſpecies of air, are ſummed up thus—" The only kind of air that is now thought to be properly *elementary*, and to conſiſt of a ſimple ſubſtance, is dephlogiſticated air; with the addition at leaſt of the principle of heat, concerning which we know very little; and as it is not probable that this adds any thing to the *weight* of bodies, it can hardly be called an *element* in their compoſition. Dephlogiſticated air appears to be one of the elements of water, of fixed air, of all the acids, and many other ſubſtances, which, till lately, have been thought to be ſimple." The experiments of the French philoſophers were of the ſame nature with thoſe of Mr. Cavendiſh, but conducted on a larger ſcale. The inference drawn from them was the ſame with that already mentioned, viz. that dephlogiſticated and inflammable air in all caſes, are the two conſtituent parts of water. This opinion is alſo adopted by Mr. Kirwan in his *Treatiſe on Phlogiston*.

Some French chemiſts, however, not ſatisfied with theſe poſitive concluſions, drawn by ſome of the moſt reſpectable men in Great-Britain, maintain, that Meſſieurs Cavendiſh, Prieſtley, and Kirwan are totally miſtaken with regard to the production of water from dephlogiſticated and inflammable air; and contend that the water obtained had previouſly exiſted in the air, and was not originally produced in the operation. The fact, indeed, becomes ſomewhat dubious from ſome experiments related by Dr. Prieſtley himſelf, of which we ſhall now give an account. One conſequence of the hypotheſis in queſtion is evident, that if water really be *produced* by the deflagration of either dephlogiſticated or common air with inflammable air, the quantity of liquid obtained ought to increaſe in proportion to the quantity of the two airs conſumed, and that without any limitation. This, however, is not the caſe; and Dr. Prieſtley deſcribes, as the greateſt difficulty he ever met, with regard to the preceding theory, his ever having been able to procure any water when he revived red precipitate in inflammable air; or at leaſt not more than might have been ſuppoſed to exiſt in the inflammable air as an extraneous ſubſtance.

" The (difficulty ſays he) with reſpect to what becomes of the 2 kinds of air, was not leſſened by the attempts which I made, to collect all that I could, from repeated decompoſitions of inflammable and dephlogiſticated air in a cloſe veſſel. As I had produced water in this proceſs, when no more than a ſingle exploſion was made at a time, I tho't that, by continuing to make exploſions in the ſame veſſel, the water would not fail to accumulate till any quantity might be collected; and I intended to have collected a conſiderable part of an ounce. And as I ſhould know exactly what quantity of air I decompoſed, I had no doubt of being able to aſcertain the proportion that the water and air bore to each other. With this view a mixture was made of a large quantity of air, one third dephlogiſticated, and two thirds inflammable, from iron and oil of vitriol. But, though I had a ſenſible quantity of water at the firſt exploſion (in each of which between 4 and 5 ounce meaſures of the mixture of air were uſed) I was ſurpriſed to perceive no very ſenſible increaſe of the quantity of water on repeating the exploſions. Having, therefore, expended 48 ounce meaſures of the mixture, the proceſs was diſcontinued; and collecting the water with all the care I could, I found no more than three grains, when there ought to have been eleven.

In this proceſs, the inſide of the veſſel was always very black after each exploſion; and there iſſued from the mouth of it a denſe vapour, which the Doctor took ſome pains to collect and examine, but without effect. " That water, in great quantities, (adds he) is ſometimes produced from burning inflammable and dephlogiſticated air, is evident from the experiments of Meſſrs. Cavendiſh and Lavoiſier. I have alſo frequently collected conſiderable quantities of water in this way though never quite ſo much as the weight of the two kinds of air decompoſed. My apparatus for this purpoſe was the following: Into the mouth of a large glaſs balloon I introduced a tube, from the orifice of which there continually iſſued inflammable air from a veſſel containing iron and oil of vitriol. This being lighted, continued to burn like a candle. Preſently after the lightning of it, the inſide of the balloon always became cloudy, and the moiſture ſoon gathered in drops, and ſettled in the lower part of the balloon. To catch what might iſſue in the form of vapour, in the current of air through the balloon, I placed a glaſs tube, in which I always found ſome water condenſed. It is very poſſible, however, that in both theſe modes of experiment, the water may be converted into a kind of vapour, very different from ſteam, and capable of being conveyed a great way through air, or even water, without condenſation, along with the air with which it is mixed; and on this account it may not be poſſible, in either of theſe modes, to collect *all* the water into which the two kinds of air may be converted. The nature of the kind of vapour into which water may be changed, and which is not readily condenſed by cold, is very little underſtood, but well deſerves the attention of philoſophers. That the water collected in the balloon comes from the decompoſition of the air, and not from the freſh air circulating through it, was evident, from placing balls of hot iron in the place of the flame, and finding, that, though the balloon was as much heated by them as by the flame of the burning of the inflammable air, and conſequently there muſt have been the ſame current of external air through it, no moiſture was found in the balloon."

CHAP. III. *Of* PHLOGISTICATED AIR.

The univerſal ſentiment in favour of the exiſtence of that principle named phlogiſton, firſt ſuggeſted by Stahl, gave riſe, on the firſt appearance of Dr. Prieſtley's diſcoveries, to a theory, concerning the action of this ſubſtance upon air, and other bodies. As it has been obſerved, that air was diminiſhed in ſome caſes at leaſt, by burning, univerſally by reſpiration, and by ſome other proceſſes, it was imagined that phlogiſton was a body of ſuch a ſingular nature, that, when mixed with air, it always diminiſhed its bulk, inſtead of enlarging it, which might have been more naturally expected from the mixture of any vapour whatever. It was alſo ſuppoſed by ſome, that the phlogiſton was not only entirely devoid of gravity, but that it was a principle of poſitive levity ; ſo that the abſolute weight of bodies was diminiſhed by an union with it, and augmented when it was expelled, though their ſpecific gravity was diminiſhed. Various other ſurpriſing properties were attributed to phlogiſton : ſuch as that of giving elaſticity to air, conſtituting flame by a chemical combination with air, &c. Its emiſſion into the atmoſphere was ſuppoſed to be always attended with a diminution of air ; and therefore, all proceſſes, in which air was diminiſhed, and become noxious, ſuch as that by liver of ſulphur, a mixture of iron filings and brimſtone, &c. were called phlogiſtic proceſſes. Reſpiration of animals was taken into the ſame account ; but neither in this nor in combuſtion was it allowed that any kind of vital ſpirit was abſorbed by the blood, or ſeparated from the air by the burning body. On the contrary, it was ſtrenuouſly argued, that all this was performed by the emiſſion of phlogiſton from the lungs, or the inflamed ſubſtance, which depraved the air, and diminiſhed it in bulk ; and as all air was ſuppoſed to contain phlogiſton, it was likewiſe imagined, that, in all caſes where air was mended, as by the growing of vegetables, or agitation in water, the emendation was accompliſhed, not by the emiſſion of any thing into the atmoſphere, but by the mere abſorption of phlogiſton. In other reſpects, this ſubſtance was thought to be an exceedingly powerful principle in nature ; the light of the ſun itſelf, and the electric fluid, being ſaid to be modifications of it, the different kinds of airs to be phlogiſtic vapours, &c. ſo that the whole ſyſtem of nature ſeemed ready to be abſorbed by it at once.

The formidable powers of this principle were firſt checked by the diſcoveries of M. Lavoiſier, though the latter erred equally on the contrary ſide ; and, not content with keeping the phlogiſtic principle within due bounds, would needs deny its exiſtence altogether. In a treatiſe publiſhed in the year 1782, he firſt impugns Dr. Prieſtley's theory of reſpiration, and denies that "the reſpiration of animals has the property of phlogiſticating air in a manner ſimilar to what is effected by the calcination of metals, and many other chemical proceſſes ; and that it ceaſes not to be reſpirable till the inſtant when it becomes ſurcharged, or at leaſt ſaturated, with phlogiſton."

From theſe experiments, and many others ſimilar, it appears that the doctrine of phlogiſton had been carried too far by Dr. Prieſtley, and other Britiſh philoſophers, and that the air conſiſts of two kinds of fluids ; one perfectly ſalutary, and friendly in the higheſt degree to animal life : the other, altogether unfit for it. Theſe two appear incapable of being converted directly into one another by any proceſs, natural or artificial : for though both are deſtructible, yet they are always converted into other ſubſtances ; from which, indeed, either the one or the other may be extracted at pleaſure, by employing the proper methods.

The other properties of it are, that it is extremely fatal to animal life, and friendly to that of vegetables, inſomuch that it is now generally believed to be the true and proper nouriſhment of the latter. It ſeems to exiſt originally, in a very large quantity, in our atmoſphere. It may be ſeparated from the common maſs of air by combuſtion, by reſpiration, by putrefaction, and in ſhort, by every ſpecies of phlogiſtic proceſs ; neither is there any other ſpecies of air but what may be converted into this by means of fire, dephlogiſticated air alone excepted.

Phlogiſticated air, by thoſe chemiſts who ſupport this hypotheſis, is ſaid to be a combination of the nitrous acid with phlogiſton ; and that, in its gradual progreſs towards this, which is its ultimate ſtage, it firſt aſſumes the character of phlogiſticated nitrous acid ; then of nitrous air, in which it readily parts with its phlogiſton to the atmoſphere, or rather to the dephlogiſticated part of it ; and, laſtly, it becomes phlogiſticated air, in which the union betwixt the principles is ſo ſtrong, that it cannot be broken by ſimple expoſure to dephlogiſticated air without heat ; though the experiments of Mr. Cavendiſh ſhow, that this may be done by means of the electric ſpark, which produces the moſt violent heat we can imagine. The common air conſiſts of 28 parts of dephlogiſticated, and 72 of phlogiſticated air.

As far as the experiments hitherto publiſhed extend, we ſcarcely know more of the nature of the phlogiſticated part of the atmoſphere, than that it is not diminiſhed by lime-water, cauſtic alkalis, or nitrous air ; that it is unfit to ſupport fire, or maintain life in animals ; and that its ſpecific gravity is not much leſs than that of common air : ſo that, though the nitrous acid, by being united to phlogiſton, is converted into air poſſeſſed of theſe properrties ; and, conſequently, though it was reaſonable to ſuppoſe, that part at leaſt of the phlogiſticated air of the atmoſphere conſiſts of this acid united to phlogiſton, yet it might be fairly doubted whether the whole is of this kind, or whether there are not, in reality, many different ſubſtances confounded by us under the name of phlogiſticated air.

CHAP. IV. *Of* FIXED AIR.

This kind of air was firſt diſcovered by Van Helmont, who gave it the name of *gas ſylveſtre*, from its being emitted in great quantity, by burning charcoal. Subſequent diſcoveries ſhowed, that a fluid of the ſame kind was plentifully produced by fermenting liquor, in almoſt every kind of combuſtion, and naturally generated in a vaſt quantity in mines and coal-pits, where it is known by the name of the *choak-damp* ; that it exiſts in a concrete ſtate, in alkaline ſalts, chalk, lime-ſtone, the ſhells of marine animals, magneſia alba, &c. in a very large proportion, conſiſting of one half, and ſometimes more, of their weight ; and that it might always be attracted from the atmoſphere, in unlimited quantity, by expoſing certain ſubſtances to it. On examining the nature of this fluid, it was found ſo manifeſtly acid, that it has now obtained a place among theſe ſubſtances, under the name of *aerial acid* ; or, more improperly, *cretaceous acid*, from its being contained in great quantities in chalk, as has been already mentioned. Fixed air is the heavieſt of all permanently elaſtic fluids, excepting thoſe derived from the mineral acids. Mr. Kirwan determines it to be to common air as 1500 to 1000, the barometer being at 29.85, the thermometer at 64, and the fixed air being extracted from calcareous ſpar by marine acid, whoſe ſpecific gravity was 1.0145. He obſerved, however, that though this air was obtained in the drieſt manner poſſible, and that the globe which contained it appeared perfectly free from moiſture : yet, when carried into a room 27 degrees colder, the inſide of the globe was covered with dew, which ſoon formed viſible drops. In its concrete ſtate, fixed air is one of the heavieſt bodies in nature. Mr. Kirwan, in the 71ſt volume of the Eng. Philoſ. Tranſactions, gives an account of his ingenious method of finding the ſpecific gravity of fixed air in its fixed ſtate, when combined with calcareous earth; from which it appears, that fixed air, in that ſtate, is prodigiouſly concentrated; and were it poſſible to exiſt by itſelf in that concentrated ſtate, it would be the heavieſt body known, gold and platina excepted. Fixed air differs conſiderably in its properties from the airs already mentioned. Its acidity is manifeſt to the taſte, and ſtill more from its neutraliſing both fixed and volatile alkalis; which it will do in ſuch a manner, as not only to deſtroy their cauſticity, but to give them a manifeſtly acid taſte, and will moreover enable them to form cryſtals of a neutral or acidulous ſalt. It has a conſiderable antiſeptic power, and will even check the putrefaction of animal ſubſtances; though it has been obſerved, that in this caſe, it acts only by abſorbing the putrid effluvia already emitted from the body, and becomes itſelf very offenſive, while it ſweetens the other. When taken into the lungs, it is equally poiſonous with phlogiſticated or any other noxious air, and extinguiſhes flame as effectually; but, when mixed with dephlogiſticated air, may be inſpired without any danger, and even in its pure ſtate may be ſwallowed in large quantities, not only without danger, but with the moſt ſalutary effects in ſome diſeaſes, whence it has now become an article of the Meteria Medica. As an acid it ſtands in the loweſt rank, being expelled from alkalis by every other; though it is capable of ſeparating oils, ſulphur, and the colouring matter of Pruſſian blue, from the ſubſtances with which they are combined. In conſidering this ſubject farther, it occurred to Dr. Prieſtley, that his experiments, in which charcoal was uſed, lay open to an objection, that ſince dry wood, and imperfectly made charcoal, yielded fixed air, it might be ſaid, that all the elements of fixed air are contained in charcoal; and though this ſubſtance alone, even with the aſſiſtance of water, will not yield fixed air, this might be effected by treating it with other ſubſtances without their imparting any thing to it; eſpecially as the inflammable air procured from charcoal by means of water, appears to contain fixed air when decompoſed with the dephlogiſticated kind. In order to expel all the fixed air from charcoal, he made a quantity of it from dry oak, and pounding it while hot, inſtantly mixed 4 meaſures of it with one of red precipitate, and, putting them into an earthen retort, got, with a heat no greater than what was ſufficient to revive the mercury, a large quantity of air, half of which was fixed. Afterwards the proportion of fixed air was leſs, and at laſt no fixed air at all was obtained; but as the reſiduum was worſe than the common atmoſphere, he is thence inclined to believe, notwithſtanding Mr. Cavendiſh's experiments, that phlogiſticated air may be compoſed of phlogiſticated and dephlogiſticated air.

Fixed air was alſo produced from red precipitate mixed with braſs filings with zinc, from turbith mineral with iron filings, and from the black powder into which mercury mixed with lead is eaſily converted. In this laſt caſe the Doctor ſuppoſes that the fixed air was produced by the dephlogiſticated kind abſorbed by the metals and the phlogiſton of the lead; and this is confirmed by an obſervation, that the fixed air always comes firſt in the proceſs, when the phlogiſton is moſt readily ſeparated, but afterwards the produce becomes quite pure and dephlogiſticated. In attempting, however, to increaſe the quantity of fixed air by heating this black powder in dephlogiſticated air, he found only an augmentation of the quantity of dephlogiſticated air, and that of the pureſt kind. That dephlogiſticated air actually enters into the compoſition of the fixed air, is evident from the weight of the latter, which far exceeds that of the charcoal diſperſed in the proceſs. For, in an experiment made, the weight of the fixed air produced was 4.95 grains. Conſequently, ſuppoſing the charcoal to be wholly phlogiſton, as it is very nearly ſo, fixed air may be ſaid to conſiſt of 3.45 parts of dephlogiſticated air, and 1.5 of phlogiſton; ſo that the dephlogiſticated air is more than three times the proportion of phlogiſton in it. "I muſt not conclude, (ſays the Dr.) without obſerving, that, in one experiment, I never failed to produce fixed air; though it is not eaſy to ſee how one of its ſuppoſed elements, viz. dephlogiſticated air, could enter into it." This is by heating iron in vitriolic acid air. In one of theſe experiments, 4 ounce meaſures of the vitriolic acid air were reduced to 0.65 of an ounce meaſure; and of the quantity loſt, 3 and a half meaſures were fixed air abſorbed by lime water, and the remainder weakly inflammable. With regard to the quantity of fixed air which may be expelled from different ſubſtances, Dr. Prieſtley obſerves, that, from ſeven ounces of whiting, the pureſt calcareous ſubſtance we are acquainted with, he expelled by heat 630 ounce meaſures of air; by which means the whiting was reduced to 4 ounces. One third of this was ſomewhat phlogiſticated, the ſtandard being 1.36 and 1.41. Repeating the experiment, he obtained 440 ounce meaſures of air from 6 ounces of whiting; about one half of which was fixed air, and the remainder of the ſtandard of 1.4. On moiſtening ſome calcined whiting with water impregnated with vitriolic acid air, he obtained 90 ounce meaſures; of which the firſt portion were 3 fourths fixed air, and the ſtandard of the reſiduum 1.5; the latter had leſs fixed air, and the ſtandard of the reſiduum was 1.44.

CHAP. V. INFLAMMABLE AIR.

We owe the knowledge of the exiſtence, and of ſome remarkable properties, of this air, to Mr. Cavendiſh, by whom they were firſt publiſhed in 1767. Its effects, however, had long before been fatally experienced by miners; in whoſe ſubterraneous habitations it is often collected in ſuch quantities as to produce the moſt dreadful effects. It is produced in abundance from putrid animal and vegetable ſubſtances; and, in general, by all thoſe which part with their phlogiſton eaſily. Being much lighter than common air, it always riſes to the top of thoſe places where it is generated; ſo that it cannot be confined, except in ſome vaulted place, but always ſtrives to aſcend and mix with the atmoſphere. By itſelf it is very noxious, and will inſtantly put an end to animal life; but, when mixed with atmoſpherical air, may be breathed in a much greater quantity than fixed air. Its great inflammability in this ſtate, however, renders it very dangerous to bring any lights or even to ſtrike a flint with ſteel, in thoſe places where it abounds. But this only takes place when the inflammable air is mixed with common atmoſpherical, or with dephlogiſticated air;

in which caſe, the exploſion is much more violent than the former; for pure inflammable air extinguiſhes flame as effectually as fixed or phlogiſticated air. Beſides the ſubterraneous places already mentioned, this kind of air is found in ditches; over the ſurface of putrid waters, out of which it eſcapes; in burying places, in houſes of office, where putrid animal and vegetable matters are accumulated; and may by ſtanding or boiling, be extracted from the waters of moſt lakes and rivers, eſpecially thoſe in which great quantities of fermenting and putrifying matters are thrown; and as putrefaction thus ſeems to be the principal ſource of inflammable air, it thence happens, that much more of it is produced in warm than in cold climates. In this country, we are informed by Dr. Franklin, that if the mud at the bottom of a pond be well ſtirred, and a lighted candle brought near to the ſurface of the water immediately after, a flame will inſtantly ſpread a conſiderable way over the water, from the aſcenſion of the inflammable air, affording a very curious ſpectacle in the night-time. In colder climates, the generation of inflammable air is not ſo plentiful as to produce this phenomenon; nevertheleſs, Mr. Cavallo informs us, that it may be plentifully procured in the following manner, in all the ponds about Philadelphia. "Fill a wide mouthed bottle with the water of the pond, and keep it inverted therein; then, with a ſtick, ſtir the mud at the bottom of the pond, juſt under the inverted bottle, ſo as to let the bubbles of air which come out of it enter into the bottle: which air is inflammable. When by thus ſtirring the mud in various places, and catching the air in the bottle until this is filled, a cork or glaſs ſtopper muſt be put over it while ſtanding in the water; and then the bottle muſt be taken home, in order to examine the contained inflammable fluid at leiſure."

The great quantity of inflammable air produced in warm climates has given occaſion to ſome philoſophers to ſuppoſe, that it may poſſibly have ſome ſhare in producing certain atmoſpherical meteors. The weak lightnings without any exploſion, which are often perceived near the horizon in ſerene weather, are by them conjectured to proceed from inflammable air fired by electric exploſions in the atmoſphere. Mr. Volta ſuppoſes that the *ignes fatui* are occaſioned by the inflammable air which proceeds from marſhy grounds, and is ſet on fire by electric ſparks; but theſe phenomena can be accounted for in a more probable manner from the action of the electric fluid itſelf. This kind of air is more common than any of the other noxious airs; for there is hardly any inflammable ſubſtance on earth, out of which it may not be extracted by one means or other. The fluids, however, which go by the general name of *inflammable air*, have ſcarce any other property in common to them all, beſides thoſe of inflammability, and being ſpecifically lighter than the common atmoſpherical air. In other reſpects, the differences between them are very conſiderable. The ſmell, weight, power of burning, of preſerving their properties, and the phenomena attending their combuſtion, are by no means the ſame in them all; ſome burning in an exploſive manner; others quietly, and with a lambent flame of a white or blue colour. It is, however, neceſſary to make a proper diſtinction between an inflammable elaſtic fluid or inflammable gas, which may be properly called ſo, and that which is evidently made by combining an inflammable ſubſtance with common air; which being eaſily ſeparable from the air, leaves that fluid in the ſtate it was before. Thus a drop of either, put into a quantity of common air, mixes itſelf with it, and takes fire on the approach of flame, like a mixture of inflammable and common air; but if the air to which either is added be waſhed in water, the latter is ſoon ſeparated from it. Common air alſo becomes inflammable by being tranſmitted through ſeveral eſſential oils; and thus the air contigious to the plant called *fraxinella* becomes inflammable in calm and hot weather, by the emiſſion of its inflammable air.

By heat alone, a conſiderable quantity of this kind of air may be extracted from moſt inflammable ſubſtances, and even from ſome of the metals. Dr. Hales obtained inflammable air by ſimply diſtilling wax, pitch, amber, coals, peaſe, and oyſter-ſhells; and Mr. Fontana informs us, that he obtained a conſiderable quantity of inflammable air from ſpathoſe iron, by the action of fire only applied to it in a matraſs. Dr. Prieſtley, however, obtained it from a vaſt number of other ſubſtances, by diſtilling them into a gun-barrel; to the extremity of which was luted a tobacco-pipe or ſmall glaſs tube, with a flaccid bladder tied on the end. He obſerves, that the heat muſt be ſuddenly applied, in order to get a conſiderable quantity of air from theſe ſubſtances.—"Notwithſtanding (ſays he) the ſame care be taken in luting, and in every other reſpect, 6, or even 10 times more air may be got by a ſudden heat than a ſlow one, though the heat that is laſt applied be as intenſe as that which was applied ſuddenly. A bit of dry oak, weighing about twelve grains, will generally yield a ſheep's bladder full of inflammable air with a briſk heat, when it will only yield 2 or 3 ounce-meaſures, if the ſame heat be applied gradually." When he wanted to extract inflammable air from metals, a glaſs was uſed, the focus of which afforded a more intenſe heat than any furnace he could apply: and in this way he obtained inflammable air from ſeveral metals; as iron, braſs, and tin; but with the metallic calces he had no ſucceſs.

"With reſpect to inflammable air," ſays Dr. Prieſtley, "I have obſerved, that when ſufficient care is taken to free it from any acid vapour that may be accidentally contained in it, it is not in the ſmalleſt degree affected by a mixture of alkaline air. On the whole, therefore, I have at preſent no doubt, but that pure inflammable air, though it certainly contains water, does not neceſſarily contain any acid: yet an acid vapour may be eaſily diffuſed through it, and may perhaps, in many caſes, be obſtinately retained by it, as no kind of air ſeems to be capable of ſo great a variety of impregnations as inflammable air is."

In his analyſis of different kinds of inflammable air, the doctor obſerves, that the difference moſt commonly perceived is, that ſome of them burn with a lambent flame, ſometimes white, ſometimes yellow, and ſometimes blue; while another kind always burns with an exploſion, making more or leſs of a report when a lighted candle is dipped into a jar filled with it. The inflammable air extracted from metals by means of acids is of this laſt kind; and that from wood, coal, or other inflammable ſubſtances by means of heat, belongs to the former. It has alſo been obſerved, that their kinds of inflammable air have different ſpecific gravities: the pureſt, or that which is extracted from iron, &c. being about ten minutes as light as common air ; but ſome of the other kinds not more than twice as light.

There is an aſtoniſhing variety in the different kinds of inflammable air, the cauſe of which is very imperfectly known. The lighteſt, and therefore, probably, the pureſt kind, ſeems to conſiſt of phlogiſton and water only. But it is probable that *oil*, and that of different kinds, may be held in ſolution in ſeveral of them, and be the reaſon of their burning with a lambent flame, and alſo of their being ſo readily reſolved into fixed air when they are decompoſed by dephlogiſticated air. When inflammable and dephlogiſticated air are burned together, the weight of the water produced, is ſeldom or ever found quite equal to that of both kinds of air. May not the light, therefore, emitted from the flame, be part of the phlogiſton of the inflammable air united to the principle of heat ? And as light accomanies the electric ſpark, may not this alſo be the real aſcenſion of ſome phlogiſtic matter, though it is not eaſy to find the ſource of it ?

Some French chemiſts, who deny the exiſtence of phlogiſton, are of opinion, that inflammable air is a ſimple uncompounded element ;—but for a more full diſcuſſion of this ſubject, ſee the article PHLOGISTON.

Inflammable air is abſorbed by water in conſiderable quantity, but by the application of heat may be expelled again in equal quantity. By agitation in water, Dr. Prieſtley was formerly of opinion that this kind of air might be rendered as good as comwon air ; but this undoubtedly proceeds from the atmoſpherical air tranſmitted by the water, as is the caſe with phlogiſticated air. After a quantity of water, which had abſorbed as much inflammable air as it could, had been ſuffered to ſtand a month, it was expelled by heat, and found to be as ſtrongly inflammable as ever The water, after the proceſs, depoſited a kind of filmy matter, which he ſuppoſed to be the earth of the metal that had been employed in producing it.

Plants in general grow tolerably well in inflammable air, and the willow plant has been obſerved to abſorb great quantities of it. Its inflammability is not diminiſhed by the putrefaction of animal ſubſtances, nor does their putrefaction ſeem to be retarded by it. Animals confined in it are killed almoſt as ſoon as in fixed air : but inſects, which can live a conſiderable time in phlogiſticated air, live alſo a conſiderable time in this kind of air ; but at laſt they become torpid, and appear to be dead, though they will ſtill recover if removed into the open air. Mr. Cavallo relates, that the Abbe Fontana, having filled a large bladder with inflammable air, began to breathe it in his preſence ; after having made a very violent expiration, in which caſe the effects are moſt powerful. The firſt inſpiration produced a great oppreſſion in his lungs, the ſecond made him look very pale, and the third was ſcarce accompliſhed when he fell on his knees, through weakneſs. Birds and ſmall quadrupeds, incloſed in ſmall veſſels of this air, died after a very few inſpirations. The inflammability of this ſpecies of air has given occaſion to various projects concerning it ; ſuch as that of employing it to give light and heat ; and lamps have been deſcribed, which may be lighted by the electric ſpark in the night time. By its means alſo, very pretty artificial fires are made, with glaſs tubes bent in various directions, and pierced with a great number of ſmall apertures. The inflammable gas is introduced into theſe tubes, from a bladder filled with that fluid, and fitted with a copper cock. When the bladder is preſſed, the inflammable air being made to paſs into the tube, iſſues out of all the ſmall apertures, and is ſet on fire by a lighted taper. None of theſe contrivances however have ever been applied to any uſe ; and the ſcheme of Mr. Volta, who propoſed to ſubſtitute its exploſive force inſtead of gun-powder, is found inſufficient, on account of the weakneſs of the exploſion, except when the two airs are fired in a very great quantity, which would be incompatible with the ſmall bulk neceſſary for warlike engines.

CHAP. VI. SULPHURATED INFLAMMABLE AIR.

Dr. Prieſtley diſcovered the properties of this kind of air by means of red hot tubes : Having, among other experiments, treated manganeſe in this manner, by ſtopping one end of the heated tube with a cork before the ſteam was applied, he received 40 ounce meaſures of air, of which one ſixth was fixed air, and the reſt of the ſtandard of 1. 7, lambently inflammable. Having then opened the other end of the tube in order to admit the ſteam, air was produced more copiouſly than before. Of 50 ounces of this air, one ſeventh was fixed, and the reſt of the ſtandard of 1 .8, exploſively inflammable. The laſt portions were very turbid ; and the ſcent, eſpecially that of the laſt portion, was very ſulphureous, tinging the water of a very dark colour, by depoſiting in it a quantity of blackiſh water. However, the air itſelf became preſently tranſparent, and had no other appearance than that of any other kind of air. On looking at the jar in about 10 minutes after, it was quite black and opaque ; ſo that nothing could be ſeen in the inſide of it. Filling afterwards another jar with the ſame kind of air, in order to obſerve the progreſs of this uncommon phenomenon, he found that when the water was well ſubſided, black ſpecks began to appear in different places, and extending themſelves in all directions, at length joined each other, till the whole jar was become perfectly black, and the glaſs opaque. When this was done, he transferred the air into another jar ; and it ſoon produced a ſimilar effect upon this, though it never became ſo black as the jar in which it had been firſt received. It alſo frequently happened, that only the lower part of the jar would become black, as if the matter with which it was loaded had kept ſubſiding, though inviſibly, in the maſs of air, and occupied only the lower regions, leaving the upper part entirely free from it. On expoſing to the open air the veſſels thus turned black, the colour preſently diſappeared, and a yellow or brown incruſtation was left upon it. The ſame change took place when the veſſels were inverted in water, in order to obſerve the alteration of the air within them : but on examining this air no ſenſible change was perceived. In ſome caſes, indeed, he thought the air was injured, but it was much leſs ſo than he had expected. After depoſiting the black, matter, the air ſtill retained its ſulphureous ſcent, and he did not imagine that it would ever leave it entirely,

On trying other ſpecimens of manganeſe, no air of this kind was obtained ; but ſome time after, having occaſion to make a large quantity of inflammable air, he uſed inſtead of freſh iron, ſome that had been already melted in vitriolic acid air. Diſſolving this with a conſiderable quantity of freſh metal in diluted vitriolic acid, he found that the water in which the air was received became very black, and depoſited more ſediment than had appeared in the experiment with the manganeſe. The jars were as black as ink, but became yellow on expoſure to the air as before; ſo that there could be no doubt of its being the ſame thing he had got before. On burning a quantity of it, this kind of air appeared to contain ſome vitriolic acid, the balloon being filled with a very white denſe fume, which rendered the water ſenſibly acid to the taſte. On decompoſing it with dephlogiſticated air, however, he found the diminution exactly the ſame as when common inflammable and dephlogiſticated air were uſed; ſo that it appeared to contain neither more nor leſs phlogiſton than the other; only there was a ſmall quantity of fixed air produced, which is never the caſe with common inflammable air from vitriolic acid and iron.

Chap. VII. Of Alkaline Air.

This was procured by Dr. Prieſtley, in the beginning of his experiments, from common ſpirits of ſal-ammoniac with quick-lime, or the materials from which it is made. He did not at that time proſecute the diſcovery farther than by impregnating water with it; by which means he could make a much ſtronger alkaline ſpirit than any to be met with in the ſhops. His method of procuring it was by mixing one part of pounded ſal-ammoniac with 3 parts of ſlacked lime; and for common experiments the ſame quantity of materials would laſt a conſiderable time. This kind of air, when pure is inſtantly fatal to animal life, and extinguiſhes flame, though, when mixed with common atmoſpherical air, it is ſlightly inflammable, and alſo medicinal in faintings and other caſes of debility. A candle dipped into a jar of this air is extinguiſhed, but juſt before the flame goes out, it is enlarged by the addition of another flame of a pale yellow colour; and ſometime a weak flame ſpreads for a conſiderable way, or even through the whole body of the alkaline air. The electric ſpark taken in it appears of a red colour. Every ſpark taken in it augments its bulk, and by degrees turns the whole into inflammable air. It is remarkable that copper, which is ſo eaſily corroded by the common volatile alkalis, is not affected by alkaline air. The ſpecific gravity of this kind of air is, by Mr. Kirwan, determined to be to that of common air, as 600 to 1000; though, as he juſtly obſerves, this muſt differ very conſiderably according to the quantity of moiſture it contains.

In examining the phenomena which attend the converſion of alkaline air into the inflammable kind, Dr. Prieſtley was induced to believe it was occaſioned by heat alone, without the concurrence of light. The effects of the former were firſt perceived on heating ſome ochre of iron in alkaline air; when, though the matter turned black, as in an incipient reduction of the metal, he found a conſiderable increaſe of quantity inſtead of decreaſe in the air, as he had expected; and, on examining the quality of it, he found it contained no fixed air, but was entirely inflammable. With ſcales of iron a ſimilar enlargement was perceived; but in this way he could never increaſe the quantity to more than double that which had been originally employed, and even after this the whole ſmelled ſtrongly of volatile alkali: the iron had undergone no change. The Doctor now, concluding from theſe experiments that the change of alkaline into inflammable air was produced by this cauſe alone, proceeded to repeat experiments; in all of which however, with a burning glaſs, as a ſtrong light was alſo concerned, he heated a quantity of alkaline air in a green glaſs retort, receiving in a glaſs tube, filled with water, all the air that could be expelled from it by heat. At firſt it was all abſorbed by the water, being merely alkaline air expelled by the rarefaction; but when the bulb of the retort became red hot, he found that the bubbles driven out were not wholly abſorbed, and at laſt none of them were ſo. Theſe were altogether inflammable; ſo that no doubt remained of the change being produced by heat alone, without any intervention of light.

Chap. VIII. Of Nitrous Air.

This kind of air is plentifully obtained in all caſes where the nitrous acid is combined with phlogiſton: Thus, when it is mixed with metals, or animal or vegetable ſubſtances, nitrous air is produced in great quantities; but very ſparingly when treated with metallic caſes, earths, or other matters which are ſaid to contain little or no phlogiſton. All the metals, excepting gold, platina, and regulus of antimony, which are not ſoluble in the pure nitrous acid, yield nitrous air on being treated with it; and even from theſe, when diſſolved in aqua regia, ſome quantity of this air may be obtained. Every metal, however, does not yield it in equal quantity, with equal facility, or equally good. Silver, copper, iron, braſs, biſmuth or nickel, when put into nitrous acid, yield this air in conſiderable quantity: mercury yields it but ſlowly without the application of heat, though no great degree of it is neceſſary. Copper and iron, eſpecially the latter, require the acid to be cautiouſly applied on account of the violent emiſſion of fumes. Gold, platina, and regulus of antimony, when put into aqua regia, yield nitrous air pretty readily: but lead yields it in ſmaller proportion than any other metal, and zinc does the ſame among the ſemimetals, the elaſtic fluids produced from it being moſtly phlogiſticated air. In the production of this kind of air, great differences are perceived by a diverſity in the ſtrength of the acid. Thus, if we diſſolve copper in ſtrong nitrous acid, no nitrous air is produced, though the ſame materials will yield air in great quantities by the mere affuſion of water to dilute the acid. This is very properly explained by Dr. Prieſtley, from the property that the nitrous acid has of attracting phlogiſton, which is evident from what happens in the ſolution of mercury.

In the common experiments, no other degree of heat is neceſſary than that produced by the efferveſcence itſelf, except mercury be uſed, which requires the application of ſome degree of heat: but when the metal expoſes a very great ſurface to the acid, as is the caſe when the filings of the metal are uſed, the efferveſcence and production of nitrous air are often much quicker than can be conveniently managed. Nitrous air by itſelf is equally tranſparent and inviſible with common air, except at its firſt production, when it is ſomewhat coloured, owing to a little ſuperfluous nitrous acid, or to ſome earthy particles which are carried up with it. Its ſcent reſembles that of nitrous acid, or indeed is the very ſame; becauſe in paſſing through the common air to our noſtrils, it is decompoſed, and converted into nitrous acid. Nitrous air ſeems to be the moſt fatal to animal life of any. Even inſects, which can bear phlogiſticated and inflammable air, generally die the moment they are put into it. Frogs, ſnails, and other animals which do not reſpire very frequently, die in a few minutes, and generally do not recover even when taken out of this noxious fluid, before they are dead. Plants periſh very ſoon in nitrous air, and even in common air ſaturated with nitrous air; but Dr. Prieſtley informs us, "that though, in general, plants die almoſt immediately in water impregnated with nitrous air, yet in one caſe of this kind, when the ſuperfluous nitrous air was let out under water, ſo that no part of it was decompoſed in contact with the water, the plant grew in it remarkably well."

One of the moſt remarkable properties of nitrous air, is its diminution with dephlogiſticated air; by which means it becomes a teſt of the quantity of that kind of air contained in the atmoſphere. With pure dephlogiſticated air, the diminution is almoſt to nothing, at the ſame time that ſome quantity of nitrous acid is reproduced by the decompoſition of the nitrous air: but as our atmoſphere is always mixed with a conſiderable quantity of phlogiſticated air, on which nitrous air has no effect, the diminution in this caſe is never ſo conſiderable. Upon this principle, the *Eudiometer* is conſtructed. Another very remarkable property of nitrous air is its ſtrong antiſeptic power: inſomuch, that animal matter may, by its means, be preſerved for many months without corruption. This property, it was thought, might have been extremely uſeful on many occaſions; but Dr. Prieſtley, after a number of experiments on the ſubject, concludes in the following manner:—"Nitrous air will indeed preſerve meat from putrefaction; but after long keeping, it becomes very offenſive both to the noſtrils and palate, though the ſcent is not altogether that of putrefaction; and indeed the ſubſtance continuing quite firm, it could not be properly putrid. Having formerly experienced the remarkable antiſeptic power of nitrous air, I propoſed an attempt to preſerve anatomical preparations, &c. by means of it; but Mr. Key, who made the trial, found, that after ſome months, various animal ſubſtances were ſhrivelled, and did not preſerve their forms in this kind of air.

"In reviewing the experiments I had formerly made on this kind of air, I could not recollect any of them in which the pure nitrous acid was produced, excepting that with dephlogiſticated air, beſides the experiment in which it was decompoſed by the electric ſpark; which furniſhes a ſtrong objection to this hypotheſis." To aſcertain the matter more fully, the following experiments were made.

"When nitrous air is decompoſed by iron, or by a mixture of iron and ſulphur, the water over which the proceſs is conducted, acquires no acidity; but I had ſuppoſed that all the acid was abſorbed by the iron. Having by me a quantity of this iron which hed been reduced to perfect ruſt in nitrous air, and which, I knew, muſt have imbibed more than its weight of this air, I thought the acid might be obtained from it by diſtillation; but a quantity of this ruſt of iron, diſtilled in an earthen retort, yielded neither nitrous air nor nitrous acid, at leaſt in any quantity that could favour the common hypotheſis. I then endeavoured to decompoſe nitrous air by heating iron in it with a burning lens; and in this proceſs I ſucceeded far beyond my expectations; for the air was preſently diminiſhed in quantity, while the iron became of a darker colour, was ſometimes melted into balls, and gathered conſiderable weight, though it had no appearance of containing any nitrous acid. In the firſt experiment, the original quantity of nitrous air was diminiſhed to about one-third; and after this it was increaſed." The increaſe was found to ariſe from a production of inflammable and dephlogiſticated nitrous air.

The doctor proceeded to try various other experiments on the decompoſition of nitrous air, particularly that of burning Homberg's pyrophorus; but without any ſucceſs, or obtaining the ſmalleſt particle of nitrous acid. His concluſions from the whole are the following:

"Water ſeems to be a neceſſary ingredient in nitrous as well as inflammable air; at leaſt without a quantity of water, nitrous air cannot be formed. For example, copper will be diſſolved in ſtrong nitrous acid without producing any nitrous air, juſt as iron may be diſſolved in concentrated vitriolic acid without producing inflammable air." He concludes his experiments on this ſubject with a conjecture, that the phlogiſton, and neither the heat nor light of the electric, contributes to the decompoſition of the nitrous air. As his final ſettlements on the matter, however, are merely conjecture, without any certain experiments to confirm them, we ſhall here refer the reader to his Section on Theory, at the end of his ſixth volume of experiments, &c.

CHAP. IX. *Of* DEPHLOGISTICATED AIR.

This ſpecies differs from common nitrous air in being able to ſupport flame, though it ſtill continues fatal to animal life. Common nitrous air may be converted into the dephlogiſticated kind by particular proceſſes; though, when zinc is diſſolved in the nitrous acid, if the air be taken at different times, that which comes about the middle, or rather the latter end of the proceſs, will be of this kind; in which it not only ſupports the burning of a candle, but the flame is enlarged (ſometimes to 4 or 5 times its original bulk) by the addition of a weaker and bluiſh flame round the former; and this burning is ſometimes accompanied with a crackling noiſe, as if the candle was burning in dephlogiſticated air. It may alſo be obtained in ſome parts of the proceſs of procuring nitrous air from iron, though with this metal the ſucceſs is uncertain; but tin yields a conſiderable quantity of it. By expoſing iron to nitrous air, it may be ſo far dephlogiſticated as to admit a candle to burn in it.

In that ſection of his laſt volume, in which the doctor treats of this kind of air, he obſerves that water is abſolutely neceſſary to its compoſition, or rather to the decompoſition of the common nitrous air by iron. He had decompoſed it before, either by previouſly filling the veſſels that were to contain the nitrous air with water or with mercury; though it had always required a much longer time when the latter was made uſe of. The reaſon of its being formed at all in this laſt way, was a ſmall quantity of moiſture adhering to the inſide of the veſſel containing the mercury. As the proceſs for obtaining dephlogiſticated nitrous air by means of iron is very tedious, the doctor endeavoured to find another which ſhould be attended with leſs inconvenience. This he accompliſhed by diſſolving turnings of iron in a dilute ſolution of copper in nitrous acid (the ſame that remains after the production of nitrous air,) mixing it again with an equal quantity of water. Without this precaution, he tells us, that though the iron will at firſt be acted upon very ſlowly, yet the mixture will at length grow ſo hot as actually to boil, and the proceſs will be exceedingly troubleſome: however, it will be neceſſary, previous to any attempt to diſſolve the iron, to heat the ſolution of copper, in order to expel all the nitrous air and ſuperfluous nitrous acid. Without this precaution a quantity of common nitrous air will be produced.

Dephlogiſticated nitrous air is abſorbed by water almoſt as readily as fixed air, and in conſiderable quantity; the liquid taking up about one-half its bulk of air. After being thus ſaturated, the whole quantity of dephlogiſticated nitrous air may be expelled pure by heat, and is eaſily received in veſſels containing mercury. It was likewiſe obſerved, that as this kind of air much reſembles fixed air, in its properties of being imbibed by water and expelled again by heat, it reſembles it alſo by this farther property, that all the air which has actually been incorporated with the water will not be imbibed by water again. But the proportion of this part is 3 or 4 times greater than the correſponding part of fixed air; it is alſo conſiderably more phlogiſticated. Water impregnated with it very ſoon parts with it again on being expoſed to the atmoſphere. It diſcovers not the ſmalleſt trace of containing either acid or alkali. Its ſpecific gravity is leſs than that of common air. On heating red precipitate in this kind of air, pure dephlogiſticated air was produced without affecting, or being affected by, the nitrous air.

CHAP. X. *Of* VITRIOLIC, NITROUS, MARINE, *and other* ACID AIRS.

VITRIOLIC ACID AIR. This is always a combination of vitriolic acid with phlogiſton, and conſequently may be procured from any mixture of that acid in its highly concentrated ſtate with phlogiſtic matters. Hence it is obtained from all the metals, gold and platina excepted, on boiling them with ſtrong oil of vitriol. It is alſo procurable from the ſame acid rendered black by any phlogiſtic matter. No greater heat is required to expel this kind of air than that produced by the flame of a candle. It is the heavieſt of all ærial fluids, next to fluor acid air being to common air as 2265 to 1000. Dr. Prieſtly informs us, that a quantity of vitriolic acid thus impregnated with phlogiſton, will yield many times more air than an equal quantity of the ſtrongeſt ſpirit of ſalt. When the vitriolic acid air is produced in great plenty, the top of the phial in which it is generated is commonly filled with white vapours. The air has alſo the ſame appearance as it is tranſmitted through the glaſs tube; and it is ſometimes diſcoverable in the recipient.

NTROUS ACID AIR. This is the pure nitrous acid by itſelf, without any addition of phlogiſton. It is procured by heating the ſtrong ſpirit of nitre in a phial, and then receiving the vapour in glaſs veſſels filled with quick-ſilvee. It is, however, extremely difficult, or rather impoſſible to preſerve for a length of time by means of any fluid hitherto known. Water abſorbs it immediately, and quick-ſilver is corroded, and produces nitrous air. "But (ſays Dr. Prieſtley) though the acid vapour very ſoon unites with the quick-ſilver, yet, the jar in which it was received being narrow, the ſaline cruſt which was formed on the ſurface of the quick-ſilver, impeded the action of the acid upon it till I had an opportunity of admitting water to the air I had produced and of ſatisfying myſelf by its abſorption, of its being a real acid air, having an affinity with water ſimilar to other acid airs."

MARINE ACID AIRS. The marine acid, by heat, may be reſolved into a permanently elaſtic and tranſparent inviſible vapour, which, however, is more eaſily preſerved in its ærial ſtate than nitrous acid air, as the former has no effect upon quick-ſilver. An eaſy and cheap method of obtaining this kind of air, is by filling a phial, fitted with a glaſs tube and ſtopper, with common ſalt, and then pouring a ſmall quantity of oil of vitriol upon it; which, by the aſſiſtance of heat, will diſengage the acid principle, or the marine acid air, from the ſalt. "A phial (ſays Dr. Prieſtley) prepared in this manner will ſuffice, for common experiments, many weeks; eſpecially if ſome more oil of vitriol be occaſinally put to it. It only requires a little more heat at the laſt than at the firſt. Indeed, at firſt the heat of a perſon's hand will often be ſufficient to make it throw out the vopour. In warm weather, it will even keep ſmoaking many days without the application of any other heat. On this account, it ſhould be placed where there are no metallic utenſils which it can corrode; and it may eaſily be perceived when the phial is throwing out this acid vapour, as it always appears in the open air in form of a light white cloud."

After the marine acid has yielded all the air that can be expelled from it, it is extremely weak, ſo that it can but barely corrode iron. The gas itſelf is extremely heavier than common air, the ſpecific gravity of the two being in the proportion of 5 to 3: a cubic inch weighing 0.654 grains. It is very fatal to animal life, but leſs ſo than pure nitrous air; for flies and ſpiders live longer in marine acid than in nitrous air. In dipping a candle into a jar of this air, the flame is extinguiſhed; but the moment before it goes out, and alſo when it is afterwards firſt lighted again, it burns with a green or light blue flame, like that of common ſalt thrown into a fire. Its diminution by the electric ſpark is barely perceptible. Ice is diſſolved by it as faſt as if it touched a red-hot iron. It is partly abſorbed by almoſt every ſubſtance containing phlogiſton, and the remaining part becomes inflammable. Oil of olives abſorbs it very ſlowly, and oil of turpentine very faſt; by which they both become almoſt black, and the remainder of the air is inflammable. Eſſential oil of mint abſorbs marine air pretty faſt, becoming brown, conſiſtent, and ſo heavy as to ſink in water; and its ſcent is in a great meaſure altered. Ether abſorbs it very faſt, and has its colour altered by the impregnation, becoming firſt turpid, then yellow, and at laſt brown. The air over the ether is ſtrongly inflammable. A ſmall bit of phoſphorus ſmoked gave light in this acid air; and the elaſtic fluid was but little diminiſhed in 12 hours. On the admiſſion of water, about 4 fifths of the gas were abſorbed, and the reſt was inflammable. This change was alſo effected by a great number of other ſabſtances: ſome of which, however, required a conſiderable time to produce their effect; ſuch as cruſts of bread not burned, dry wood, dry fleſh, roaſted pieces of beef, ivory, and even flint.

Of FLUOR ACID AIR. The diſcovery of fluor acid air was made by Mr. Scheele, who obtained it by diſtilling the ſpar called fluor with vitriolic acid. Its moſt remarkable property is the great attraction it has for ſiliceous earth, ſo that it even corrodes and makes holes in the retorts in which it is diſtilled.

Of the Vegetable *and another* Acid Air. By means of heat alone, the concentrated vegetable acid emits a permanently elaſtic and aerial fluid. This has the properties of the acid of vinegar; but, like it, is weaker than the reſt of the mineral acid airs, though it agrees with them in its general characters.

An acid air, ſomewhat different from any hitherto deſcribed, was obtained by Dr. Prieſtley from the vapour ariſing on diſtilling to dryneſs a ſolution of gold in marine acid impregnated with nitrous acid vapour, which makes the beſt kind of aqua regia. "The produce, (ſays he) was an acid of a very peculiar kind, partaking both of the nature of the nitrous and marine acids, but more of the latter than of the former, as it extinguiſhed a candle; but it was both extinguiſhed and lighted again with a moſt beautiful deep blue flame. A candle dipped into the ſame jar with this kind of air went out more than 20 times ſucceſſively, making a vey pleaſing experiment. The quantity of this acid air is very great; and the reſiduum I have ſometimes found to be dephlogiſticated, ſometimes phlogiſticated, and at other times nitrous air."

Chap. XI. *Of* Hepatic Air.

This ſpecies of air was firſt particularly taken notice of by Mr. Bergman, who obtained it from an ore of zinc called *Pſeudogalena nigra Dannemorenſis*, and which was found to contain 29 parts of ſulphur, one of regulus of arſenic, 6 of water, 6 of lead, 9 of iron, 45 of zinc, and 4 of ſilicious earth. The hepatic air was produced but in ſmall quantity by pouring oil of vitriol on this mineral; ſpirit of ſalt produced it in much larger quantity; but nitrous acid produced only nitrous air. The moſt proper method of obtaining this air is by pouring marine acid on hepar ſulphuris, which extricates it in vaſt quantity. The ſcent of the pure gas is intollerable; and the vapour has a diſagreeable effect on many metallic ſubſtances, particularly ſilver, lead, copper, &c, deſtroying their colour, and rendering them quite black. It is ſuddenly fatal to animal life.

Chap. XII. *Of* Atmospherical Air.

The two component parts of our atmoſphere, viz. dephlogiſticated and phlogiſticatod air, have been ſo fully treated of in their reſpective chapters, that little remains to be ſaid in this place, excepting to determine the proportion in which they are uſually met with in the common air. The only regular ſet of experiments which have been made on this ſubject, are thoſe of Mr. Scheele. He conſtructed an eudiometer, conſiſting of a glaſs receiver, which could contain 34 ounces of water, and a glaſs cup containing a mixture of one pound of iron filings, and an equal weight of flowers of ſulphur moiſtened; which cup ſtanding upon a glaſs ſupporter, was inſerted in the glaſs receiver, which, when this was in it, could contain 33 ounces of water. To the outſide of the glaſs tube or receiver, was affixed a ſlip of paper, to the height of a third of the tube, containing 11 diviſions, each correſponding to one ounce of water. This paper was varniſhed over with oil varniſh, to prevent its being ſpoiled by water. The whole was then placed in water, which gradually roſe as the air was diminiſhed. This mixture would ſerve 4 times before the power of diminiſhing air was loſt. He carefully compared the height of the air therein with the barometer and thermometer, both before and after the experiment; in eight hours the experiment was completed. With this inſtrument he examined the goodneſs of the common air in Stockholm every day for a whole year, and found the diminution never to exceed $\frac{10}{33}$, nor to fall ſhort of $\frac{8}{33}$; ſo that upon a medium it may be eſtimated at $\frac{9}{33}$. During the months of January and February it was $\frac{9}{33}$. The 23d of March it was $\frac{8}{33}$, though the cold increaſed, and the barometer ſtood higher than before. The 19th of April it was $\frac{10}{33}$, though the barometer and thermometer did not vary, and ſo ſtood till the 21ſt. In May and June it ſtood between $\frac{8}{33}$ and $\frac{9}{33}$. The 30th of July it ſtood at $\frac{10}{33}$. From the 3d to the 15th of September at $\frac{9}{33}$. The 6th of October at $\frac{10}{33}$, during a high ſtorm; but after it ſtood between $\frac{8}{33}$ and $\frac{9}{33}$, till the 4th of November, when it fell to $\frac{8}{33}$, and continued between $\frac{8}{33}$ and $\frac{9}{33}$ to the 20th, when it roſe to $\frac{10}{33}$. The 21ſt it fell to 8, and ſtood between $\frac{8}{33}$ and $\frac{9}{33}$ till the 8th of December, when it roſe to $\frac{9}{33}$; and from thence to the 31ſt it ſtood between $\frac{8}{33}$ and $\frac{9}{33}$.

As it has already been ſhown, that the pure dephlogiſticated part of the atmoſphere is entirely conſumed by phlogiſtic proceſſes, ſuch as that of fermenting brimſtone and iron filings, this eudiometer muſt be conſidered as an exact teſt of the proportion of dephlogiſticated air contained in the atmoſphere. The ſmall variation in the quantity ſhows, that the proceſſes in nature which deſtroy this air, are nearly balanced by thoſe which produce it; though it muſt appear ſurpriſing, that both theſe fluids, ſo extremely different, ſhould be produced at all ſeaſons of the year in a proportion nearly equal; nor it is leſs ſurpriſing, that two fluids of equal ſpecific gravity, ſhould remain incorporated together without any tendency to ſeparate, which it is certain they never do, either in the atmoſphere itſelf, or when confined in veſſels in any quantity whatever. As phlogiſticated air is ſomewhat lighter than dephlogiſticated, it might be ſuppoſed that the former would occupy the higher regions of the atmoſphere in ſuch a manner, as to render them conſiderably more unwholeſome than the lower parts; but this ſeems not to be the caſe. On the contrary, it appears by experiments with the eudiometer, that the upper parts of the air contain a greater proportion of dephlogiſticated air than thoſe near the earth.

Chap. XIII. *Of the* Artificial Production *of* Airs *of* different Kinds.

Fixed Air, or Aerial Acid. The artificial methods of producing this are principally three, viz. by fermentation, by heat, and by acids.

1. *By* Fermentation. When vegetable and animal ſubſtances, eſpecially the former, are fermented, they yield a great quantity of fixed air. In breweries, on the ſurface of the fermenting liquors, there is always a ſtratum of fixed air reaching as high as the edge of the vats; ſo that if theſe veſſels are deep, and the fermenting liquor much below their edges, the above-mentioned ſtratum may be ſome feet in thickneſs. The ſame phenomenon is obſervable in the fermentation of wines in general; and it is owing to the pro-

duction and elaſticity of fixed air, that fermenting liquors, when put into cloſe veſſels, often burſt them with great violence. The caſe is the ſame whatever ſubſtance it is that undergoes the vinous fermentation, though the quantity of fixed air produced is not the ſame in all ſubſtances, nor even in the ſame ſubſtance at different times. From 42 cubic inches of beer, Dr. Hales obtained 639 cubic inches of air in 13 days. From a quantity of ſugar undergoing the vinous fermentation, Mr. Cavendiſh obtained ſo much fixed air, that out of 100 parts of the former, 57 appeared to have been volatilized and converted into fixed air. But though a vaſt quantity of fixed air eſcapes during this proceſs of fermentation, a very conſiderable portion ſtill remains united with the fermented liquor, and to this it owes all its briſkneſs and agreeable pungent acidulous taſte; for when the fixed air is totally evaporated, the liquor becomes entirely vapid and flat. Hence alſo we are furniſhed with a method of reſtoring the briſkneſs to theſe liquors after they have loſt it, in conſequence of being expoſed to the atmoſphere, viz. by impregnating them again with fixed air, either naturally or artificially produced.

2. *By* HEAT. In every combuſtion, except that of ſulphur or of metals, a quantity of fixed air is generated. This may be obſerved by fixing a lighted candle in an inverted receiver over a baſon of lime-water, for a precipitation of lime will preſently enſue; and the ſame precipitation (which is one of the characteriſtics of fixed air) will always enſue, whether a candle, a burning piece of wood, or in ſhort, any other combuſtible ſubſtance, except ſulphur or metals, be made uſe of.

Moſt minerals contain fixed air, which may be extracted to a certain degree by means of heat. Mr. Krenger, diſtilling a greeniſh fuſible ſpar, which was luminous in the dark, obtained from it ſome permanently elaſtic fluid, which, like fixed air, cryſtalized a ſolution of fixed alkali. Mr. Fontana, in his analyſis of the Malachite, finds that that mineral contains a vaſt quantity of fixed air, as pure as that which is extracted from chalk by means of vitriolic acid. From almoſt every metallic ore and earthy mineral, ſome fixed air may be obtained, as well as from chalk, lime-ſtone, marble, marine ſhells, fixed and volatile alkali, and from magneſia, alba, by means of a violent fire, or of acids.

3. *By* ACIDS. Calcareous ſubſtances in general produce abundance of fixed air, when acted upon by any acid, only the ſtrongeſt acids will expel from them more fixed air than the weakeſt; and it happens to be peculiarly advantageous for thoſe who want to produce a great quantity of fixed air, that the vitriolic acid is both the cheapeſt and ſtrongeſt acid, and, upon the whole, the fitteſt for this purpoſe. The phenomena attending the production of fixed air from calcareous ſubſtances, &c. are themſelves very remarkable, and furniſh the ſubject of much ſpeculation in philoſophy.

It is for its great property of hindering putrefaction, that fixed air by itſelf, or incorporated with various fluids, eſpecially with water; and that vegetables, ſugar, and other ſubſtances which abound with fixed air, are very powerful remedies in putrid diſeaſes. Sir John Pringle ſuppoſes, with great probability, that the frequent uſe of ſugar and freſh vegetables, which at this time make up a conſiderable part of the diet of the European nations, prevents thoſe putrid diſeaſes and plagues which formerly were rather frequent. Dr. Macbride, ſhewing experimentally, that fixed air is diſcharged by ſuch ſubſtances as form our common food, aſcribes the preſervation of the body from putrefaction, in a great meaſure, to the fixed air, which, in the ordinary proceſs of digeſtion, is diſengaged from the aliment, and incorporates with the fluids of the body.

From the ſame property, it may be alſo uſefully applied to ſeveral œconomical purpoſes. Mr. Henry found that fixed air can preſerve fruit for a conſiderable time. He tried a bunch of Italian grapes, which being ſuſpended in the middle part of Dr. Nooth's apparatus, and being ſupplied with plentiful ſtreams of fixed air every day, was preſerved without any ſigns of decay, for about one month longer than a ſimilar bunch ſuſpended in a decanter containing common air. Strawberries and cherries, he alſo found to be preſerved without decay ſome days longer in fixed than in common air. Indeed, fixed air preſerves not only fruit, but reſiſts putrefaction in general. Dr. Macbride, in his elegant Eſſays on Medical and Philoſophical Subjects, has publiſhed various experiments, which demonſtrate this property of fixed air. He found, that not only good meat was preſerved incorrupt for a conſiderable time, when expoſed to fixed air, but that the putrefaction of ſubſtances actually putrid, was impelled by this means, and even that theſe ſubſtances were reſtored from the putreſcent to a ſound ſtate. That putrefaction was checked by fermentation, was diſcovered by Sir John Pringle; and Dr. Macbride obſerved, that this effect was owing to the fixed air produced in the act of fermentation.

Sir William Lee, baronet, in two of his letters to Dr. Prieſtley, informs him of his having found, that freſh meat, even in the hot ſeaſon, could be preſerved wholeſome for ſeveral days, by only waſhing it 2 or 3 times a day in water impregnated with fixed air. "We have been enabled," ſays he, to "preſerve meat as perfectly ſweet and good to the extent of 10 days, as at the firſt killing; and there ſeems no doubt it might be preſerved much longer." He has even recovered ſome meat that had begun to change. This uſeful diſcovery, Sir William juſtly obſerves, may be very beneficial to the public, eſpecially to butchers. "Particularly a butcher," ſays he, who deals pretty largely, aſſures me he found the greateſt ſucceſs from it, and only objects that the veal was a little diſcoloured, though kept perfectly ſweet."

Fixed air, as it combines with water, ſo it may be combined with other liquors. Beer, wine, and other fermented liquors, may be impregnated with fixed air, and by this means their ſharpneſs may be reſtored, when they are become vapid, or, as it is commonly ſaid, *dead*. The acidulous taſte communicated by the impregnation of fixed air, cannot be diſcovered in beer, wines, and, in ſhort, in ſuch liquors which have much taſte of their own. Milk acquires acidulous taſte by being impregnated with fixed air; and is thereby preſerved incorrupt for ſome days; which affords a very eaſy expedient of preſerving milk in thoſe places where it cannot be had new very often.

To produce INFLAMMABLE AIR. The proceſs for making this ſort of gas is the ſame as that for making fixed air: one of the materials only muſt be different, viz. iron filings, or groſsly powdered zinc, muſt be uſed inſtead of chalk; to which filings ſome oil of vitriol and water muſt be added, in the ſame proportion as in the fixed air, or rather a little more of oil of vitriol.

Inſtead of the filings of iron, ſmall nails or ſmall bits of iron wire, anſwer equally well.

When a ſlender pipe is tied to the neck of a bladder, and the bladder is filled with inflammable air, two very pleaſing experiments may be performed with it. Firſt, the inflammable gas may be inflamed by applying the flame of a candle to the extremity of the pipe, and ſqueezing, at the ſame time, the bladder, a ſtream of fire will be formed in the air, which will laſt as long as the bladder contains any inflammable air; for this gas coming out of the pipe with violence, will continue inflamed for a conſiderable way in the air. Secondly, the extremity of the pipe may be dipped into a ſolution of ſoap, then removing it from the ſolution, and ſqueezing the bladder very gently, a ball of ſoap water may be formed, including inflammable air; which ball, on account of the inflammable gas being much lighter than common air, as ſoon as it is detached from the pipe, will aſcend upwards, and will break by daſhing againſt the ceiling, contrary to thoſe commonly made by children, which in ſtill air go downwards. Whilſt the ball is aſcending, if the flame of the candle be approached to it, the film of ſoap water will be inſtantly broke, and the inflammable air will take fire. Thus a flame may be ſhown to be ſeemingly produced from a ſoap ball.

Zinc, treated after the ſame manner, produces the like effects, except that it gives more elaſtic fluid, without the application of heat, than iron does; and the greateſt part of the produced elaſtic fluid is inflammable. In order to obtain the greateſt quantity of inflammable air from iron zinc, the vitriolic acid muſt be diluted with much water, as about one part of the ſtrong oil of vitriol to 5 or 6 parts of water. Dr. Prieſtley found, that 11 grains of iron yielded 8¼ ounce meaſures of inflammable air. According to Mr. Cavendiſh, one ounce of zinc, diſſolved either in the vitriolic or marine acid, yields a quantity of inflammable air equal to the bulk of 356 ounces of water; one ounce of iron, diſſolved by means of vitriolic acid, yields a quantity of inflammable air equal to the bulk of 412 ounces of water; and one ounce of tin yields half as much inflammable air as iron does.

The ſolutions of iron, tin, copper, lead, and zinc, in the marine acid, produce marine acid air, and inflammable air, but in various quantities. The proportion of the former to the latter, is as one to 8 in iron, as one to 6 in tin, as 3 to one in copper and lead, and as one to 10 in zinc. Regulus of antimony, diſſolved in marine acid, with the application of heat, yields a ſmall quantity of elaſtic fluid, which is weakly inflammable. For other methods of producing this kind of air, ſee the ſyſtem of AEROLOGY.

To produce NITROUS AIR. This permanently elaſtic fluid is never found naturally, like fixed or inflammable air, but is entirely artificial.

Either ſilver, copper, braſs, iron, mercury, biſmuth, or nickel, when mixed with nitrous acid, yields nitrous air in great quantities. Some of them, eſpecially mercury, require the aid of heat, in order to produce the elaſtic fluid; the flame of a candle applied to the phial is ſufficient: but others, eſpecially copper and iron, do not want the application of any heat. Gold, platina, and the regulus of antimony, when put in aqua regia, yields nitrous air pretty readily. Among the metals, lead yields nitrous air in the ſmalleſt quantity. Among the ſemi-metals, zinc gives the weakeſt nitrous air, when diſſolved in nitrous acid. The elaſtic fluid produced from it is moſtly phlogiſticated air. From four penny-weights and 17 grains of zinc, diſſolved in ſpirit of nitre, diluted with an equal quantity of water, Dr. Prieſtley obtained about 12 ounce meaſures of very weak nitrous air. It occaſioned a very ſlight efferveſcence when mixed with common air. The Doctor obtained nitrous air even from ſome flowers of zinc. The quantity of nitrous air that may be obtained from various metals, is difficult to be aſcertained, on account of the diverſity occaſioned by the ſtrength of the acid, the various nature of the metallic ſubſtance, and the method of performing the experiments.

As the nitrous air is moſtly neceſſary to try the goodneſs of reſpirable air, it is of great conſequence to make it always of one conſtant degree of goodneſs; but this object is anſwered by diſſolving ſubſtances of a very homologous nature in the nitrous acid; therefore, it is plain, that the metals whoſe nature is more uniform, muſt be preferred for this purpoſe. Accordingly, braſs yields nitrous air of a more uniform nature than iron: copper is ſuperior to braſs; but mercury is ſtill ſuperior to copper: and, indeed, this is the metal which, conſidering its nature, uniformity of ſubſtance, and eaſy ſolution, is upon the whole, the moſt uſeful for this purpoſe.

To procure DEPHLOGISTICATED AIR. This is no other than exceedingly pure atmoſpherical air, entirely free from thoſe heterogeneous vapours which contaminate the air we commonly breathe. The eaſieſt method of procuring this air is to put ſome red lead into a bottle, together with ſome good ſtrong oil of vitriol, but without any water. Let the red lead fill about a quarter of the bottle, and the vitriolic acid be about the ſame quantity, or very little leſs; then apply the bent tube to the bottle, and proceed in the ſame manner as above. But it muſt be remarked, that without heat, this mixture of red lead and vitriolic acid will not give any dephlogiſticated air, or it yields an inconſiderable quantity of it; for which reaſon, the flame of a candle (that of a wax taper is ſufficient) muſt be applied under the bottom of the bottle; which for this purpoſe muſt be rather thin, otherwiſe it will be eaſily cracked.

In this manner the red lead will yield a good quantity of elaſtic fluid, the greateſt part of which is dephlogiſticated air; but not the whole quantity of it, for a good portion of fixed air comes out with it. In order to ſeparate the fixed from the dephlogiſticated air, the inverted bottle, when filled with the compound of both, as it is emitted from the red-lead, muſt be ſhook in the baſin for impregnating water with fixed air; by which means the water will abſorb the whole quantity of fixed air, and leave the dephlogiſticated air by itſelf.

From every experiment it appears, that dephlogiſticated air, if it could be readily obtained, and at a cheap rate, would be a moſt valuable manufacture. The heat communicated by it to burning fuel is incredible.

Theſe are not the only advantages which might be expected from dephlogiſticated air. It has been found by experience, that animals will live longer in this kind of air than in an equal quantity of common air; whence it is ſuppoſed, that the breathing of it muſt be much more healthy, and contribute to longevity much more than the common atmoſphere. Nay, there are not wanting, ſome who attribute the longevity of the Antedeluvians to the great purity of the atmoſphere at that time ; the whole maſs being afterwards tainted by the deluge, in ſuch a manner that it could never regain its former purity and ſalubrity. But all this as yet is mere conjecture ; and excepting the ſingle fact, that animals live much longer in a quantity of dephlogiſticated than of common air, there is no evidence that the former contributes more to longevity than the latter. Dr. Prieſtley even throws out a conjecture that dephlogiſticated air might perhaps wear out the ſyſtem much ſooner than common air, in the ſame manner as it conſumes fuel much faſter than common air. The great quantity, however, even of the pureſt air, which is requiſite to ſupport animal life, and the expence and trouble of the moſt ready methods of procuring it, have hitherto prevented any fair trial from being made. Yet philoſophers, conſidering the probability there is of this kind of air being ſalutary in many diſeaſes, have beſtowed ſome pains in attempting to find out methods of procuring it eaſy, and in large quantities.

To procure Vitriolic Acid Air. This conſiſts of the vitriolic acid, united with ſome phlogiſton, which volatilizes and renders it capable of aſſuming the form of a permanently elaſtic fluid. To obtain it, ſome ſtrong concentrated vitriolic acid muſt be put into the uſual bottle, together with ſome ſubſtance capable of furniſhing phlogiſton. Olive oil anſwers very well. The oil of vitriol ſhould be 3 or 4 times as much as the ſweet oil, and both together ſhould fill one third or half the bottle. A gentle degree of heat is then required, in order to let theſe materials yield any elaſtic fluid ; which may be done by applying the flame of a wax taper, as before directed for the production of dephlogiſticated air.

To procure Marine Acid Air, which is no other than the marine acid itſelf, and which without any addition becomes a permanently elaſtic fluid ; put ſome ſea ſalt, or common kitchen ſalt, into the uſual bottle in which the materials for producing elaſtic fluids are generally put, ſo as to fill about a 4th part of it, and upon this ſalt pour a ſmall quantity of good concentrated vitriolic acid ; then apply the bent tube to the bottle, and introduce it through the quickſilver into the receiver, filled with and inverted in quickſilver after the uſual method, and the elaſtic fluid is copiouſly produced.

To procure Nitrous Acid Air. This may be obtained from heated nitrous acid, the vapour of which acquires a permanent elaſticity, and it has been found to remain uncondenſed into a viſible fluid by any cold to which it has hitherto been expoſed. The great difficulty is to find a fluid capable of confining this acid air ; becauſe it is eaſily and abundantly abſorbed by water, which is one of its properties by which it differs from nitrous air. It acts upon quickſilver, and alſo upon oils ; hence its examination cannot be made but very imperfectly ; for ſubſtances muſt be expoſed to it, or mixed with it, whilſt it is actually changing its nature by acting on the mercury or other fluid that confines it. When water has abſorbed a good quantity of this fluid, it acquires the properties of nitrous acid ; and when heated, it yields a large quantity of nitrous air, viz. a quantity many times greater than that which water is wont to imbibe of it by agitation, or by any known means. When the nitrous acid air is combined with eſſential oils, a conſiderable efferveſcence and heat are produced, nearly in the ſame manner as when the nitrous acid itſelf is poured upon thoſe oils.

Fluor Acid Air. Put ſome of theſe minerals called *fluors* or *fuſible ſpars*, pulverized, into the uſual bottle, and upon it pour ſome concentrated oil of vitriol ; then adapt the bent tube, &c. The fluor acid air is at firſt produced without the help of heat ; but in a ſhort time it will be neceſſary to apply the flame of a candle to the bottle, by which means a conſiderable quantity of this elaſtic fluid is obtained.

Alkaline Air. Let the uſual bottle be about half filled with volatile ſpirit of ſal-ammoniac ; and after applying the bent tube, &c. let the flame of a candle be brought under the bottle, by which means the alkaline air will be copiouſly produced.

AEROMANCY, *n. s.* the art of divining by the air.

Aeromancy, in antiquity, included the buſineſs of *augury* and *auſpicia* ; the rules of prediction from uncommon winds, ſtorms, ſhowers, and other prodigies. Modern authors ſpeak of a more rational *aeromancy*, meaning by it, the art of foretelling the changes and variations in the air and weather, winds, ſtorms, and the like. Morhof advances conſiderations for reducing aeromancy to a certainty, by means of a regular ſeries of meteorological obſervations. But though many ſuch have been inſtituted with great care in many parts, this art has hitherto made very ſmall progreſs. Of this kind is Auxham's book *De Aere*. Barometers, thermometers, hygrometers, and anemometers, are of conſiderable uſe in this kind of aeromancy. Mizoldus has publiſhed a body of rules for foretelling ſtorms, &c. drawn partly from vulgar obſervation, and the experience of mariners, partly from aſtrological obſervations, under the title of Aeromantia.

AEROMANTIC, belonging to divination by the air.

ÆROMELI, a name given to honey, and alſo to manna. See Drosomeli.

AEROMETRY, *n. s.* the art of meaſuring the air.

Aerometry, comprehends not only the doctrine of the air itſelf, conſidered as a fluid body ; but alſo its preſſure, elaſticity, rarefaction, and condenſation. But the term is at preſent not much in uſe, this branch of natural philoſophy being more frequently called Pneumatics, which ſee.

AERONAUT, *n. s.* a perſon who mounts in and guides an air balloon. See Aerostation and Air Balloon.

AERONAUTICA, the art of ſailing in a veſſel or machine through the atmoſphere, ſuſtained as a ſhip in the ſea. See Aerostation.

AEROPHYLACEA, in natural hiſtory, ſubterraneous receptacles of air or wind. Kircher ſpeaks much of aerophylacea, huge caverns, replete with air, diſpoſed under ground, from whence, through numerous occult paſſages, that element is conveyed either to ſubterraneous receptacles of water, which are raiſed into ſprings or rivers, or into the funds of ſubterraneous fire, which are hereby ſuppoſed to be fed for the reparation of metals, minerals, and the like.

AEROSCOPY, *n. s.* the obſervation of the air.

AEROSTAT, *n. s.* a machine employed in aeroſtation.

AEROSTATIC, *adj.* belonging to aeroſtation.

AEROSTATICA, Aerostatics, is uſed by ſome authors for Aerometry. It is properly the doctr weight, preſſure, and balance of the air and atmoſphere.

Chap. I. *Of the* Discovery *of* Aerostation.

THE word, in its primitive ſenſe, denotes the ſcience of ſuſpending weights in the air; but, in its modern acceptation, it ſignifies *aerial navigation*, or the art of navigating through the atmoſphere. Hence alſo the machines which are employed for this purpoſe are called *aerostats*, or *aerostatic* machines; and, from their globular ſhape, *air-balloons*.

The romances of almoſt every nation have recorded inſtances of perſons being carried through the air, both by the agency of ſpirits and by mechanical inventions; but till the time of the celebrated Lord Bacon, no rational principle appears to have been thought of, by which this might be accompliſhed. Before that time, indeed, Friar Bacon had written upon the ſubject; and many had been of opinion, that, by means of artificial wings, fixed to the arms or legs, a man might fly as well as a bird; but theſe opinions were thoroughly refuted by Borelli in his treatiſe *De Motu Animalium;* where, from a compariſon between the power of the muſcles which move the wings of a bird, and thoſe which move the arms of a man, he demonſtrates that the latter are utterly inſufficient to ſtrike the air with ſuch force as to raiſe him from the ground. It cannot be denied, however, that wings of this kind, if properly conſtructed, and dexterouſly managed, might be ſufficient to break the fall of a human body from an high place, ſo that ſome adventurers in this way might poſſibly come off with ſafety; though by far the greateſt number of thoſe who have raſhly adopted ſuch ſchemes, have either loſt their lives or their limbs in the attempt.

Mr. Henry Cavendiſh firſt aſcertained the weight and other properties of inflammable air, determining it to be at leaſt 7 times lighter than common air. Soon after which, it occurred to Dr. Black, that perhaps a thin bag filled with inflammable air might be buoyed up by the common atmoſphere; and he thought of having the allantois of a calf prepared for this purpoſe; but his other avocations prevented him from proſecuting the experiment. The ſame thought occurred ſome years afterwards to Mr. Cavallo; and he has the honour of being the firſt who made experiments on the ſubject. He firſt tried bladders: but the thinneſt of theſe, however well ſcraped and prepared, were found too heavy. He then tried Chineſe paper; but that proved ſo permeable, that the vapour paſſed through it like water through a ſieve. His experiments, therefore, made in the year 1782, proceeded no farther than blowing up ſoap-bubbles with inflammable air, which aſcended readily to the ceiling, and broke againſt it.

But while the diſcovery of the art of aeroſtation ſeemed thus on the point of being made in Britain, it was all at once announced in France, and that from a quarter whence nothing of the kind was to have been expected. Two brothers, Stephen and John Montgolfier, natives of Annonay, and maſters of a conſiderable paper-manufactory there, had turned their thoughts towards this project as early as the middle of the year 1782. The idea was firſt ſuggeſted by the natural aſcent of the ſmoke and clouds in the a[illegible]re; a[illegible] their deſign was to form an artifi[illegible] cl[illegible] ſmoke in a bag, and making it carry [illegible] with it. Towards the middle of Nov[illegible]er [illegible] experiment was made at Avi[illegible]n [illegible] parallelopiped ſhape. By a[illegible] lower aperture, the air was rarefied, and the bag aſcended in the atmoſphere, and ſtruck rapidly againſt the ceiling. On repeating the experiment in the open air, it roſe to about the height of 70 feet. An experiment on a more enlarged ſcale was now projected; and a new machine, containing about 650 cubic feet was made which broke the cords that confined it, and roſe to the height of about 600 feet. Another of 35 feet in diameter roſe about 1000 feet high, and fell to the ground three quarters of a mile from the place where it aſcended.

A public exhibition was next made on the 5th of June, 1783, at Annonay, where a vaſt number of ſpectators aſſembled. An immenſe bag of linen, lined with paper, and containing upwards of 23,000 cubic feet, was found to have a power of lifting about 500 pounds, including its own weight. The operation was begun by burning chopped ſtraw and wool under the aperture of the machine, which immediately began to ſwell; and, after being ſet at liberty, aſcended into the atmoſphere. In ten minutes it had aſcended 6000 feet; and when its force was exhauſted, it fell to the ground at the diſtance of 7668 feet from the place from whence it ſet out.

Some time after this experiment had been made, one of the brothers arrived at Paris, where he was invited by the Academy of Sciences to repeat his experiments at their expence. In conſequence of this invitation, he conſtructed, in a garden in the Fauxbourg of St. Germain, a large balloon of an elliptical form. In a preliminary experiment this machine lifted up from the ground 8 perſons who held it, and would have carried them all off, if more had not quickly come to their aſſiſtance. Next day the experiment was repeated in preſence of the members of the Academy; the machine was filled by the combuſtion of 50 pounds of ſtraw made up in ſmall bundles, upon which about 12 pounds of chopped wool were thrown at intervals. The uſual ſucceſs attended this exhibition: the machine ſoon ſwelled; endeavoured to aſcend; and immediately after ſuſtained itſelf in the air, together with the charge of between 4 and 500 weight. It was evident that it would have aſcended to a great height; but as it was deſigned to repeat the experiment before the king and royal family at Verſailles, the cords by which it was tied were not cut. But in conſequence of a violent rain and wind which happened at this time, the machine was ſo far damaged, that it became neceſſary to prepare a new one for the time that it had been determined to honour the experiment with the royal preſence; and ſuch expedition was uſed, that this vaſt machine, of near 60 feet in height, and 43 in diameter, was made, painted with water-colours both within and without, and finely decorated, in no more than 4 days and 4 nights. With this machine was ſent up a wicker cage, containing a ſheep, a cock, and a duck, which were the firſt animals ever ſent through the atmoſphere. The full ſucceſs of the experiment was prevented by a violent guſt of wind, which tore the cloth in 2 places near the top, before it aſcended; however, it roſe to the height of 1440 feet; and, after remaining in the air about 8 minutes, fell to the ground at the diſtance of 10,200 feet from the place of its ſetting out. The animals contained in it did not receive the leaſt injury.

From the great power of theſe aeroſtatic machines, and their very gradual deſcent in falling to the ground, it was reaſonably ſuppoſed that they were capable of conveying people through the air with all imaginable ſafety; and this was further confirmed by the experiment already mentioned.

Encouraged by the ſucceſs of theſe experiments, M. Montgolfier propoſed to make a new aeroſtatic machine of a firmer and better conſtruction than the former: and M. Pilatre de Rozier offered himſelf to be the firſt aerial adventure.

This new machine was conſtructed in a garden in the Fauxbourg of St. Antoine. It was of an oval ſhape, about 48 feet in diameter, and 74 in height; elegantly painted on the outſide with the ſigns of the zodiac, cyphers of the king's name, and other ornaments. A proper gallery, grate, &c. were appended; ſo that it was eaſy for the perſon who aſcended to ſupply the fire with fuel, and thus keep up the machine as long as he pleaſed. The weight of the whole apparatus was upwards of 1600 pounds.

The experiment was performed on the 15th of October, 1783. M. Pilatre having placed himſelf in the gallery, the machine was inflated, and permitted to aſcend to the height of 84 feet, where he kept it afloat for about 4 minutes and a half; after which it deſcended very gently: and ſuch was its tendency to aſcend, that it rebounded to a conſiderable height after touching the ground.

Two days after, he repeated the experiment with the ſame ſucceſs as before; but, the wind being ſtrong, the machine did not ſuſtain itſelf ſo well as formerly. However, on repeating the experiment in calmer weather, he aſcended to the height of 210 feet. His next aſcent was 252 feet; and in the deſcent a guſt of wind having blown the machine over ſome large trees of an adjoining garden, M. Pilatre ſuddenly extricated himſelf from ſo dangerous a ſituation, by throwing ſome ſtraw and chopped wool on the fire, which raiſed him at once to a ſufficient height. On deſcending again, he once more raiſed himſelf to a proper height, by throwing ſtraw on the fire. Some time after, he aſcended in company with M. Girond de Villette, to the height of 330 feet; hovering over Paris at leaſt 9 minutes, in ſight of all the inhabitants, the machine, during the time, keeping quite ſtationary.

From theſe experiments, it was evident, that the aeroſtatic machines might be raiſed or lowered at the pleaſure of the perſons who aſcended: they had likewiſe diſcovered, that keeping them faſt with ropes was no advantage; but, on the contrary, that this was attended with inconvenience and hazard.

On the 21ſt of November, 1783, M. Pilatre determined to undertake an aerial voyage, in which the machine ſhould be ſet at full liberty. Every thing being got in readineſs, the balloon was filled in a few minutes, and M. Pilatre placed himſelf in the gallery, counterpoiſed by the Marquis d'Arlandes, who occupied the other ſide. It was intended to make ſome preliminary experiments on the aſcending power of the machine: but the violence of the wind prevented this from being done, and even damaged the balloon eſſentially; ſo that it would have been entirely deſtroyed, had not timely aſſiſtance been given. The extraordinary exertions of the workmen, however, repaired it again in 2 hours, and the adventurers ſet out. They met with no inconvenience during their voyage, which laſted about 25 minutes; during which time they had paſſed over a ſpace of above 5 miles. From the account given by the Marquis d'Arlandes, it appeared that they met with ſeveral different currents of air, the effect of which was, to give a very ſenſible ſhock to the machine, and the direction of the motion ſeemed to be from the upper part, downwards. It appeared alſo that they were in ſome danger of having the balloon burnt altogether, as the Marquis obſerved ſeveral round holes made by the fire in the lower part of it, which alarmed him conſiderably, and indeed, not without reaſon. However, the progreſs of the fire was eaſily ſtopped by the application of a wet ſponge, and in a ſhort time, all appearances of danger ceaſed.

This voyage of M. Pilatre and the Marquis d'Arlandes, may be ſaid to conclude the hiſtory of thoſe aeroſtatic machines which are elevated by means of fire; for though many other attempts have been made upon the ſame principle, moſt of them have either proved unſucceſsful, or of little conſequence. They have therefore given place to the other kind, filled with inflammable air; which, by reaſon of its ſmaller ſpecific gravity, is both more manageable, and capable of performing voyages of greater length, as it does not require to be ſupplied with fuel like the others. This was invented a very ſhort time after the diſcovery made by M. Montgolfier. This gentleman had, indeed, deſigned to keep his method in ſome degree a ſecret from the world; but as it could not be concealed, that a bag filled with any kind of fluid lighter than the common atmoſphere would riſe in it, inflammable air was naturally thought of as a proper ſuccedaneum for the rarefied air of M. Montgolfier.

The firſt experiment was made by two brothers named Roberts, and M. Charles, a profeſſor of experimental philoſophy. The bag which contained the gas was compoſed of luteſtring, varniſhed over with a ſolution of the elaſtic gum called *caoutchouc*; and that with which they made their firſt eſſay was only about 13 Engliſh feet in diameter. Many difficulties occurred in filling it with the inflammable air, chiefly owing to their ignorance of the proper apparatus; inſomuch, that, after a whole day's labour, from nine in the morning, they had got the balloon only one-third part full. Next morning, they were ſurpriſed to find that it had fully inflated of itſelf during the night: but, upon inquiry, it was found, that they had inadvertently left open a ſtop-cock connected with the balloon, by which the common air gaining acceſs, had mixed itſelf with the inflammable air; forming a compound ſtill lighter than the common atmoſphere, but not ſufficiently light to anſwer the purpoſes of aeroſtation. Thus they were obliged to renew their operation; and, by 6 o'clock in the evening of the next day, they found the machine conſiderably lighter than the common air; and, in an hour after, it made a ſtrong effort to aſcend. The public exhibition, however, had been announced only for the third day after; ſo that the balloon was allowed to remain in an inflated ſtate for a whole day; during which they found it had loſt a power of aſcent equal to about 3 pounds, being one-ſeventh part of the whole. When it was ſet at liberty, after having been well filled with inflammable air, it was 35 pounds lighter than an equal bulk of common air. It remained in the atmoſphere only three quarters of an hour, during which it had traverſed 15 miles. It deſcended very ſuddenly, which was ſuppoſed to have been owing to a rupture that had taken place in the balloon.

The ſucceſs of this experiment, and the aerial voyage made by Meſſrs. Rozier and Arlandes, naturally ſuggeſted the idea of undertaking ſomething of the ſame kind with a balloon filled with inflammable air. The machine uſed on this occaſion was formed of gores of ſilk, covered over with a varniſh made of *caoutchouc*, of a ſpherical figure, and meaſuring 27½ feet in diameter. A net was ſpread over the upper hemiſphere, and faſtened to an hoop which paſſed round the middle of the balloon. To this a ſort of car, or rather boat, was ſuſpended by ropes, in ſuch a manner as to hang a few feet below the lower part of the balloon; and, in order to prevent the burſting of the machine, a valve was placed in it; by opening of which ſome of the inflammable air might be occaſionally let out. A long ſilken pipe communicated with the balloon, by means of which it was filled. The boat was made of baſket-work, covered with painted linen, and beautifully ornamented; being 8 feet long, 4 broad, and 3½ deep; its weight 130 pounds. At this time, however, as at the former, they met with great difficulties in filling the machine with inflammable air, owing to their ignorance of the moſt proper apparatus. But at laſt, all obſtacles being removed, the two adventurers took their ſeats at three quarters after one in the afternoon of the firſt of December, 1783. Perſons ſkilled in mathematics were conveniently ſtationed with proper inſtruments to calculate the height, velocity, &c. of the balloon. The weight of the whole apparatus, including that of the two adventurers, was found to be 604½ pounds, and the power of aſcent, when they ſet out, was 20 pounds; ſo that the whole difference betwixt the weight of this balloon and an equal bulk of common air was 624 pounds. But the weight of common atmoſphere diſplaced by the inflammable gas was calculated to be 771 pounds, ſo that there remains 147 for the weight of the latter; and this calculation makes it only 5¼ times lighter than common air.

At the time the balloon left the ground the thermometer ſtood at 9° of Fahrenheit's ſcale, and the quick-ſilver in the barometer at 30.18 inches; and, by means of the power of aſcent with which they left the ground, the balloon roſe till the mercury fell to 27 inches, from which they calculated their height to be about 600 yards. By throwing out ballaſt occaſionally as they found the machine deſcending by the eſcape of ſome of the inflammable air, they found it practicable to keep at pretty near the ſame diſtance from the earth during the reſt of their voyage; the quick-ſilver fluctuating between 27 and 27.65 inches, and the thermometer between 53° and 57°, the whole time. They continued in the air for the ſpace of an hour and three quarters, when they alighted at the diſtance of 27 miles from Paris; having ſuffered no inconvenience during their voyage, nor experienced any contrary currents of air, as had been felt by Meſſrs. Pilatre and Arlandes. As the balloon ſtill retained a great quantity of inflammable gas, Mr. Charles determined to take another voyage by himſelf. Mr. Robert accordingly got out of the boat, which was thus lightened by 130 pounds, and of conſequence the aeroſtatic machine now had nearly as much power of aſcent. Thus he was carried up with ſuch velocity, that in 20 minutes he was almoſt 9,000 feet high, and entirely out of ſight of terreſtrial objects. At the moment of his parting with the ground, the globe had been rather flaccid; but it ſoon began to ſwell, and the inflammable air eſcaped from it in great quantities through the ſilken tube. He alſo frequently drew the valve that it might be the more freely emitted, and the balloon effectually prevented from burſting. The inflammable gas being conſiderably warmer than the external air, diffuſed itſelf all round, and was felt like a warm atmoſphere; but in 10 minutes the thermometer indicated a variation of temperature as great as that between the warmth of ſpring and the ordinary cold of winter. His fingers were benumbed by the cold, and he felt a violent pain in his right ear and jaws, which he aſcribed to the dilatation of the air in thoſe organs as well as to the external cold. The beauty of the proſpect which he now enjoyed, however, made amends for theſe inconveniencies. At his departure, the ſun was ſet on the vallies; but the height to which Mr. Charles was carried in the atmoſphere, rendered it again viſible, though only for a ſhort time. He ſaw, for a few ſeconds, vapours riſing from the vallies and rivers. The clouds ſeemed to aſcend from the earth, and collect one upon the other, ſtill preſerving their uſual form; only their colour was grey and uniform for want of ſufficient light in the atmoſphere.—By the light of the moon, he perceived that the machine was turning round with him in the air; and he obſerved that there were contrary currents which brought him back again. He obſerved alſo, with ſurpriſe, the effects of the wind, and that the ſtreamers of his banners pointed upwards; which, he ſays, could not be the effect either of his aſcent or deſcent, as he was moving horizontally at the time. At laſt, recollecting his promiſe of returning to his friends in half an hour, he pulled the valve, and accelerated his deſcent.—When within 200 feet of the earth, he threw out 2 or 3 pounds of ballaſt, which rendered the balloon again ſtationary: but in a little time afterwards, he gently alighted in a field about 3 miles diſtant from the place where he ſat out; though by making allowance for all the turnings and windings of the voyage, he ſuppoſed he had gone through nine miles at leaſt. By the calculations of M. de Maunier, he roſe at this time not leſs than 10,500 feet high; a height ſomewhat greater than that of Mount Ætna. A ſmall balloon, which had been ſent off before the two brothers ſet out on their voyage, took a direction oppoſite to that of the large one, having met with an oppoſite current of air, probably at a much greater height.

The ſubſequent aerial voyages differ ſo little from that juſt now related, that any particular deſcription of them ſeems to be ſuperfluous. It had occurred to Mr. Charles, however, in his laſt flight, that there might be a poſſibility of directing the machine in the atmoſphere; and this was ſoon attempted by M. Jean-Pierre Blanchard, a gentleman who had, for ſeveral years before, amuſed himſelf with endeavours to fly by mechanical means, though he had never ſucceeded in the undertaking. As ſoon as the diſcovery of the aeroſtatic machines was announced, however, he reſolved to add the wings of his former machine to a balloon, and made no doubt that it would then be in his power to direct himſelf through the air at pleaſure. In his firſt attempt he was fruſtrated by the impetuoſity of a young gentleman, who inſiſted, right or wrong, on going along with him. In the ſcuffle which enſued on this occaſion, the wings and other apparatus were entirely deſtroyed; ſo that M. Blanchard was obliged to commit himſelf to the direction of the wind: and in another attempt, it was found, that all the ſtrength he could ſupply was ſcarce ſufficient to counteract the impreſſion of the wind in any degree. In his voyage, he found his balloon, at a certain period, acted upon by two contrary winds; but, on throwing out 4 pounds of ballaſt, he aſcended to a place where he met with the ſame current he had at ſetting out from the earth. His account of the ſenſations he felt during this voyage, was ſomewhat different from that of Mr. Charles; having, in one part of it, found the atmoſphere very warm, in another cold; and having once found himſelf very hungry, and at another time almoſt overcome by a propenſity to ſleep. The height to which he aroſe, as meaſured by ſeveral obſervations with mathematical inſtruments, was thought to be very little leſs than 10,000 feet; and he remained in the atmoſphere an hour and a quarter.

The attempts of M. Blanchard to direct his machine thro' the atmoſphere, were repeated in the month of April, 1784. Meſſrs. Morveau and Bertrand, at Dijon, who raiſed themſelves with an inflammable air-balloon to the height, as it was thought, of 13,000 feet; paſſing through a ſpace of 18 miles in an hour and 15 minutes. M. Morveau had prepared a kind of oars for directing the machine through the air; but they were damaged by a guſt of wind, ſo that only two of them remained ſerviceable: by working theſe, however, they were able to produce a ſenſible effect on the motion of the machine. In a third aerial voyage performed by M. Blanchard, he ſeemed to produce ſome effect by the agitation of his wings, both in aſcending, deſcending, moving ſidewiſe, and even in ſome meaſure againſt the wind; however, this is ſuppoſed, with ſome probability, to have been a miſtake, as, in all his ſucceeding voyages, the effects of his machinery could not be perceived.

The ſucceſs of Meſſrs. Charles and Roberts, in their former experiments, encouraged them ſoon to repeat them, wih the addition of ſome machinery to direct their courſe. Having enlarged their former balloon to the ſize of an oblong ſpheroid of 16½ feet long, and 27½ in diameter, they made it to float with its longeſt parallel to the horizon. The wings were made in the ſhape of an umbrella without the handle, to the top of which a ſtick was faſtened, parallel to the aperture of the umbrella. Five of theſe were diſpoſed round the boat, which was near 17 feet in length. The balloon was filled in 2 hours, and, with the addition of 450 pounds of ballaſt, remained *in equilibrio* with the atmoſphere. About noon, on the 19th of September, 1784, they began to aſcend very gently in conſequence of throwing out 24 pounds of ballaſt, but were ſoon obliged to throw out 8 pounds more in order to avoid running againſt ſome trees. Thus they roſe to the height of 1400 feet, when they perceived ſome thunder-clouds near the horizon. On this they aſcended and deſcended, to avoid the danger, as the wind blew directly towards the threatening clouds; but, from the height of 600 feet to that of 4200 above the ſurface of the earth, the current was quite uniform and in one direction. During their voyage they loſt one of their oars; but found, that by means of thoſe which remained, they conſiderably accelerated their courſe. From the account of their voyage, it appeared that they had paſſed ſafely through the thunder-clouds; as we are informed, that, about 40 minutes after three, they heard a loud clap of thunder, and three minutes after, another much louder; at which time the thermometer ſunk from 77 to 59 degrees. This ſudden cold, occaſioned by the approach of the clouds, condenſed the inflammable air, ſo that the balloon deſcended very low, and they were obliged to throw out 40 pounds of ballaſt; yet, on examining the heat of the air within the balloon, they found it to be 104°, when that of the external atmoſphere was only 63. When they had got ſo high that the mercury in the barometer ſtood only at 23·94 inches, they found themſelves becalmed; ſo that the machine did not go even at the rate of 2 feet in a ſecond, though it had before gone at the rate of 24 feet in a ſecond. On this they determined to try the effect of their oars to the utmoſt; and, by working them for 35 minutes, and marking the ſhadow of the balloon on the ground, they found, in that time, that they had deſcribed the ſegment of an ellipſis, whoſe longeſt diameter was 6000 feet. After having travelled about 150 miles, they deſcended, only on account of the approach of night, having ſtill 200 pounds of ballaſt left.

Having thus related all that has been done with regard to the conducting of ærostatic machines through the atmoſphere, we ſhall now relate the attempts that have been made to leſſen their expence, by concerting ſome contrivance to aſcend without throwing out ballaſt, and to deſcend without loſing any of the inflammable air.

The firſt attempt of this kind was made by the Duke de Chartres; who, on the 15th of July 1784, aſcended with the two brothers, Charles and Roberts, from the Park of St. Cloud. The balloon was of an oblong form, made to aſcend with its longeſt diameter horizontally, and meaſured 55 feet in length, and 24 in breadth. It contained within it a ſmall balloon filled with common air; by blowing into which with a pair of bellows, and thus throwing in a conſiderable quantity of common air, it was ſuppoſed that the machine would become ſufficiently heavy to deſcend, eſpecially as, by the inflation of the internal bag, the inflammable air in the external one would be condenſed into a ſmaller ſpace, and thus become ſpecifically heavier. The voyage, however, was attended with ſuch circumſtances as rendered it impoſſible to know what would have been the event of the ſcheme. The power of aſcent with which they ſet out ſeems to have been very great; as, in 3 minutes after parting with the ground, they were loſt in the clouds, and involved in ſuch a denſe vapour, that they could ſee neither the ſky nor the earth. In this ſituation they ſeemed to be attacked by a whirl-wind, which, beſides turning the balloon 3 times round from right to left, ſhook and beat it ſo about, that they were rendered incapable of uſing any of the means propoſed for directing their courſe, and the ſilk ſtuff of which the helm had been compoſed, was even torn away. No ſcene can be conceived more terrible than that in which they were now involved. An immenſe ocean of ſhapeleſs clouds rolled one upon another below them, and ſeemed to prevent any return to the earth, which ſtill continued inviſible, while the agitation of the balloon became greater every moment. In this extremity they cut the cords which held the interior balloon, and of conſequence it fell down upon the aperture of the tube that came from the large balloon into the boat, and ſtopped it up. They were then driven upwards by a guſt of wind from below, which carried them to the top of that ſtormy vapour in which they had been involved. They now ſaw the ſun without a cloud; but the heat of his rays, with the diminiſhed denſity of the atmoſphere,

phere, had ſuch an affect on the inflammable air, that the balloon ſeemed every moment ready to burſt. To prevent this they introduced a ſtick through the tube, in order to puſh away the inner balloon from its aperture; but the expanſion of the inflammable air puſhed it ſo cloſe, that all attempts of this kind proved ineffectual. It was now, however, become abſolutely neceſſary to give vent to a very conſiderable quantity of inflammable air; for which purpoſe, the Duke de Chartres himſelf bored two holes in the balloon, which tore open for the length of 7 or 8 feet. On this they deſcended with great rapidity; and would have fallen into a lake, had they not haſtily thrown out 60 pounds of ballaſt, which enabled them juſt to reach the water's edge.

The ſucceſs of the ſcheme for raiſing or lowering aeroſtatic machines by means of bags filled with common air, being thus rendered dubious, another method was thought of. This was to put a ſmall aeroſtatic machine with rarefied air under an inflammable air-balloon, but at ſuch a diſtance that the inflammable air of the latter might be perfectly out of the reach of the fire uſed for inflating the former; and thus, by increaſing or diminiſhing the fire in the ſmall machine, the abſolute weight of the whole would be conſiderably diminiſhed or augmented. This ſcheme was unhappily put in execution by the celebrated M. Pilatre de Rozier, and another gentleman named M. Romaine. Their inflammable air-balloon was about 37 feet in diameter, and the power of the rarefied air one was equivalent to about 60 pounds. They aſcended without any appearance of danger or ſiniſter accident; but had not been long in the atmoſphere, when the inflammable air-balloon was ſeen to ſwell very conſiderably, at the ſame time that the aeronauts were obſerved, by means of teleſcopes, very anxious to get down and buſied in pulling the valve and opening the appendage, to the balloon, in order to facilitate the eſcape of as much inflammable air as poſſible. A ſhort time after this the whole machine was on fire, when they had then attained the height of about three quarters of a mile from the ground. No exploſion was heard; and the ſilk which compoſed the air-balloon continued expanded, and ſeemed to reſiſt the atmoſphere for about a minute; after which it collapſed, and the remains of the apparatus deſcended along with the two unfortunate travellers ſo rapidly, that both of them were killed. M. Pilatre ſeemed to have been dead before he came to the ground; but M. Romaine was alive when ſome perſons came up to the place where he lay, though he expired immediately after. Theſe are the moſt remarkable attempts that have been made to improve the ſcience of aeroſtation; though a great number of other expeditions through the atmoſphere have taken place.

But of all the voyages which had been hitherto projected or put in execution, the moſt enterpriſing was that of M. Blanchard and Dr. Jeffries, an American phyſician reſident in London, acroſs the ſtraits of Dover, which ſeparate Britain from France. This took place on the 7th of January, 1785, being a clear froſty morning, with a wind, barely perceptible, at N. N. W. The operation of filling the balloon began at 10 o'clock, and, at three quarters after 12, every thing was ready for their departure. At one o'clock M. Blanchard deſired the boat to be puſhed off, which now ſtood only two feet diſtant from that precipice ſo finely deſcribed by Shakeſpeare, in his tragedy of King Lear. As the balloon was ſcarcely ſufficient to carry two, they were obliged to throw out all their ballaſt except three bags of 10 pounds each; when they at laſt roſe gently, though making very little way on account of there being ſo little wind. At a quarter after one o'clock, the barometer, which on the cliff ſtood at 29.7 inches, was now fallen to 27.3, and the weather proved fine and warm. They had now a moſt beautiful proſpect of the ſouth coaſt of England, and were able to count 37 villages upon it. After paſſing over ſeveral villages, they found that the balloon, at 50 minutes after one, was deſcending, on which they threw out a ſack and an half of ballaſt; but as they ſaw that it ſtill deſcended, and that with much greater velocity than before, they now threw out all the ballaſt. This ſtill proving ineffectual, they next threw out a parcel of books they carried along with them, which made the balloon aſcend when they were about midway betwixt France and England. At a quarter paſt two, finding themſelves again deſcending, they threw away the remainder of their books, and ten minutes after, they had a moſt enchanting proſpect of the French coaſt. Still, however, the machine deſcended; and as they had now no more ballaſt, they were obliged to throw away their proviſions for eating, the wings of their boat, and every other moveable they could poſſibly ſpare. "We threw away," ſays Dr. Jeffries, "our only bottle, which in its deſcent, caſt out a ſteam like ſmoke, with a ruſhing noiſe; and when it ſtruck the water, we heard and felt the ſhock very perceptibly on our car and balloon." All this proving inſufficient to ſtop the deſcent of the balloon, they next threw out their anchors and chords, and at laſt ſtripped off their clothes, faſtening themſelves to certain ſlings, and intending to cut away the boat as their laſt reſource. They had now the ſatisfaction, however, to find that they were riſing; and as they paſſed over high lands between Cape Blanc and Calais, the machine roſe very faſt, and carried them to a greater height than they had been at any former part of their voyage. In a ſhort time after they deſcended ſafely among ſome trees in the foreſt of Guiennes.

It would be tedious as well as unneceſſary to recount all the other aerial voyages that have been performed in other countries: it appeared ſufficient for the purpoſe of this article to notice thoſe which were moſt remarkable and intereſting; and therefore an account of the ingenious Mr. Baldwin's excurſion from Cheſter, with the particular circumſtances attending it, and Mr. Blanchard's voyage from Philadelphia, ſhall now cloſe our enumeration.

On the 8th of September 1785, at 40 minutes paſt one P. M. Mr. Baldwin aſcended from Cheſter in Mr. Lunardi's balloon. After traverſing in a variety of directions, he firſt alighted, at 28 minutes after 3, about 12 miles from Cheſter, in the neighbourhood of Frodſham; then re-aſcending and purſuing his excurſion, he finally landed at Rixton-moſs, 5 miles N. N. E. of Wavington, and 35 miles from Cheſter. Mr. Baldwin has publiſhed his obſervations and remarks made during his voyage, and taken from minutes. Our limits will not admit of relating many of his obſervations, but the few following are ſome of the moſt important and curious. "The ſenſation of aſcending is compared to that of a ſtrong preſſure from the bottom of the car upwards againſt the ſoles of his feet. A few ſeconds of time before the balloon had attained its greateſt height, the ſtriking contraſt and novelty of his ſituation filled him with unuſual and pleaſing ſenſations. The ſky was painted with a purer and more tranſparent azure. The ſun ſhone hot, and with a brighter luſtre. His beams were white and ſparkling; not ſurrounded with haze or vapour; but too fierce for the human eye to look upon a ſecond time with pleaſure. At the diſtance of what appeared to him ſeven miles from the earth, though by the barometer ſcarcely a mile and a half, he had a grand and moſt enchanting view of the city of Cheſter and its adjacent places below. The river Dee appeared of a red colour, the city very diminutive, and the town entirely blue. The whole appeared a perfect plain, the higheſt building having no apparent height, but reduced all to the ſame level, and the whole proſpect appeared like a coloured map. Juſt after his firſt aſcent, being in a well watered and maritime part of the country, he obſerved a remarkable and regular tendency of the balloon towards the ſea; but, ſhortly after, riſing into another current of air, he eſcaped the danger. This upper current, he ſays, was viſible to him at the time of his aſcent, by a lofty ſound ſtratum of clouds flying in a ſafe direction. The perſpective appearance of things to him was very remarkable. The loweſt bed of vapour that firſt appeared as a cloud was pure white, in detached fleeces, increaſing as they roſe: they preſently coaleſced, and formed, as he expreſſes it, a ſea of cotton, tufting here and there by the action of the air in the undiſturbed part of the clouds. The whole became an extended white floor of cloud, the upper ſurface being ſmooth and even. Above this white floor he obſerved, at great and unequal diſtances, a vaſt aſſemblage of thunder-clouds, each parcel conſiſting of whole acres in the denſeſt form; he compares their form and appearance to the ſmoke of pieces of ordnance, which had conſolidated as it were into maſſes of ſnow, and penetrated through the upper ſurface and white floor of common clouds, there remaining viſible and at reſt. Some clouds had motions in ſlow and various directions, forming an appearance truly ſtupendous and majeſtic." Mr. Baldwin alſo gives a curious deſcription of his tracing the ſhadow of the balloon over tops of volumes of clouds. At firſt it was ſmall, in ſize and ſhape like an egg; but ſoon increaſed to the magnitude of the ſun's diſk, ſtill growing larger, and attended with a moſt captivating appearance of an iris encircling the whole ſhadow at ſome diſtance round it, the colours of which were remarkably brilliant. The regions did not feel colder, but rather warmer, than below. The ſun was hotteſt to him when the balloon was ſtationary. The diſcharge of a cannon when the balloon was at a conſiderable height, was diſtinctly heard by the aeronaut; and a diſcharge from the ſame piece, when at the height of 30 yards ſo diſturbed him as to oblige him for ſafety to lay hold firmly of the cords of the balloon. At a conſiderable height he poured down a pint bottle full of water, and as the air did not oppoſe a reſiſtance ſufficient to break the ſtream, into ſmall drops, it moſtly fell down in large drops. In the courſe of the balloon's track it was found much affected by the water, a circumſtance obſerved in former aerial voyages. At one time the direction of the balloon kept continually over the water, going directly towards the ſea, ſo much as to endanger the aeronaut; the mouth of the balloon was opened, and he in two minutes deſcended into an under current blowing from the ſea: he kept deſcending, and landed at Bellair farm in Pinney 12 miles from Cheſter. Here he lightened his car by 31 pounds, and inſtantly re-aſcending, was carried into the interior part of the country, performing a number of different manœuvres. At his greateſt altitude he found his reſpiration free and eaſy. Several bladders which he had along with him crackled and expanded conſiderably. Clouds and land, as before, appeared on the ſame level. By way of experiment, he tried the upper valve two or three times, the neck of the balloon being cloſe; and remarked, that the eſcape of the gas was attended with a growling noiſe like mill ſtones, but not near ſo loud. Again, round the ſhadow of the balloon, on the clouds, he obſerved the iris. A variety of other circumſtances and appearances which he met with, is fancifully deſcribed; and at 53 minutes paſt 3 he finally landed.

The only aerial voyage, which has as yet been made in the United States, was performed by M. Blanchard, who aſcended from the priſon court, Philadelphia, on the 9th of January, 1793. At 9 o'clock in the morning, he began to fill the balloon, and to prepare for his intended aſcenſion. When this proceſs was finiſhed, which took up about an hour, and every thing was ready for the aſcent, he took his leave of the illuſtrious Waſhington, then Preſident of the United States, who gave him a folded paper, which was ſaid to contain a recommendation to the inhabitants of that part of the country on which he ſhould deſcend, to treat him with attention, and render him every aſſiſtance of which he might ſtand in need. M. Blanchard having then bowed reſpectfully to the ſpectators, aſcended the car, and after throwing out ſome ballaſt, the balloon, preciſely at 5 minutes paſt 10, roſe in a ſlow and majeſtic manner, whilſt the air reſounded in all quarters with the loudeſt ſhouts of applauſe from the innumerable ſpectators of this intereſting and truly ſublime ſpectacle. So long as M. Blanchard remained in view, he was ſeen waving the flag of the United States, which he held in his hand; but after he had been a few minutes in the air, the balloon aſſumed an appearance ſomewhat ſimilar to that of the full moon, after which its dimenſions ſeemed rapidly to diminiſh, till becoming at laſt altogether inviſible, the minds of the ſpectators were left to form their own conjectures, with reſpect to the fate of this intrepid voyager. Immediately after its aſcent, the balloon took a South-eaſterly direction, and M. Blanchard, after having croſſed the Delaware, and continuing 46 minutes in the air, deſcended, after making 3 unſucceſsful attempts, near Woodbury, in Glouceſter county, N. Jerſey, about 17 miles from Philadelphia. He would have proceeded much farther, but the hazineſs of the horizon, eſpecially over the ſea, towards which he was flying, rendered it, in his opinion, highly imprudent for him to lengthen the voyage. He ſuppoſed that his greateſt perpendicular height was about two miles. Altho' this was M. Blanchard's 45th aſcenſion, he ſeemed very willing to venture again upon another excurſion of the ſame kind. He accordingly, in conjunction with the late Mr. Gardner Baker, of New-York, iſſued propoſals to aſcend from that city in the ſummer of the year 1796. The ſcheme was greatly encouraged by the inhabitants, who were eager to be gratified with the aſcent of the two intended voyagers. The balloon was almoſt, if not altogether finiſhed, and every thing in a ſtate of great forwardneſs, for the aerial flight, when a thunder ſtorm having happened, the balloon and the whole apparatus were unfortunately demoliſhed.

Chap. II *Of the* Utility *of* Aerostation.

We have heard it aſſerted, though with what degree of truth we cannot ſay, that, ſoon after the diſcovery of aeroſtation, and aerial navigation, a certain reſpectable Philoſophical Society in London, gave it as their decided opinion, that aeroſtation could never be applied to any uſeful purpoſe. A very oppoſite opinion, however, has been delivered upon the ſubject, by Mr. Cavallo, (not to mention others,) a gentleman well known in the philoſophical world. Among the various uſes to which it is poſſible air balloons may be applied, he enumerates the following:

"The ſmall balloons, eſpecially thoſe made of paper, and raſed by means of ſpirit of wine, may ſerve to explore the direction of the winds in the upper regions of the atmoſphere, particularly when there is a calm below: they may ſerve for ſignals in various circumſtances, in which no other means can be uſed; and letters and other ſmall things may be eaſily ſent by them, for inſtance, from ſhips that cannot ſafely land on account of ſtorms, from beſieged places, iſlands or the like. The larger aeroſtatic machines may anſwer all the above mentioned purpoſes in a better manner; and they may, beſides, be uſed as a help to a perſon who wants to aſcend a mountain, a precipice, or to croſs a river; and perhaps one of thoſe machines tied to a boat by a long rope, may be, in ſome caſes, a better ſort of ſail than any that is uſed at preſent. The largeſt ſort of machines, which can take up one or more men, may evidently be ſubſervient to various œconomical and philoſophical purpoſes. Their conveying people from place to place with great ſwiftneſs, and without trouble, may be of eſſential uſe, even if the art of guiding them in a direction different from that of the wind ſhould never be diſcovered. By means of thoſe machines the ſhape of certain ſeas and lands may be better aſcertained; men may aſcend to the tops of mountains they never viſited before; they may be carried over marſhy and dangerous grounds; they may by that means come out of a beſieged place, or an iſland; they may, in hot climates, aſcend to a cold region of the atmoſphere, either to refreſh themſelves or to obſerve the ice, which is never ſeen below; and, in ſhort, they may be thus taken to ſeveral places, to which human art hitherto knew of no conveyance.

"The philoſophical uſes to which theſe machines may be ſubſervient, are numerous indeed; and it may be ſufficient to ſay, that hardly any thing which paſſes in the atmoſphere is known with preciſion, and that principally for want of a method of aſcending into it. The formation of rain, of thunder ſtorms, of vapours, hail, ſnow, and meteors in general, requires to be attentively examined and aſcertained. The action of the barometer, the refraction and temperature of the air in various regions, the deſcent of bodies, the propagation of ſound, &c. are ſubjects which all require a ſeries of obſervations and experiments, the performance of which could never have been properly expected, before the diſcovery of aeroſtatic machines."

We may add to theſe uſes the gratification of curioſity a very ſtrong inducement to the practice of an art, in which, with any tolerable degree of caution, there appears to be little riſque. With regard to the ſuppoſed danger from encountering thunder clouds, Mr. Cavallo has ſuggeſted ſeveral conſiderations. Balloons have been raiſed when thunder has been heard without injury. But in caſe of danger, the aeronauts may either deſcend to the earth, or aſcend above the region of the clouds and thunder ſtorms. Balloons conſiſt of materials that are not conductors of electricity, and they are leſs likely to receive ſtrokes from being encompaſſed with air. Moreover, inflammable air, unmixed with a certain quantity of common air, will not burn; ſo that if an electric ſpark ſhould happen to paſs through a balloon, it would not ſet fire to the inflammable air.

Chap. III. *Of the* Principles *of* Aerostation.

The general principles of aeroſtation are ſo little different from thoſe of hydroſtatics, that it is almoſt ſuperfluous to inſiſt on them. It is a fact univerſally known, that when a body is immerſed in any fluid, if its weight be leſs than an equal bulk of that fluid, it will riſe to the ſurface; but if heavier, it will ſink; and if equal, it will remain in the place where it is left. For this reaſon ſmoke aſcends into the atmoſphere, and heated air in that which is colder. Upon this ſimple principle depends the whole theory of aeroſtation.

A cubic foot of air has been found to weigh about 554 grains, and to be expanded by every degree of heat, about one-five-hundredth part of the whole. By heating a quantity of air, therefore, to 500 degrees of Fahrenheit, we juſt double its bulk when the thermometer ſtands at 54 in the open air, and in the ſame proportion we diminiſh its weight; and if ſuch a quantity of this hot air be encloſed in a bag, and the exceſs of the weight of an equal bulk of common air weighs more than the bag with the air contained in it, both the bag and the air will riſe into the atmoſphere, and continue to do ſo, until they arrive at a place where the external air is naturally ſo much rarefied, that the weight becomes equal; and here the whole will float.

From the frequent exhibition of aeroſtatic machines, the power of hot air in raiſing weights, or rather that by which it is itſelf impelled upwards, has been illuſtrated by a variety of experiments, with which every one is familiar. From theſe it appears, that in the aeroſtatic machines on Montgolfier's plan, it muſt be an advantage to have them as large as poſſible; becauſe a ſmaller quantity of fire will then have a greater effect in raiſing them, and the danger from that element, which, in this kind of machine, is chiefly to be dreaded, will be in a great meaſure avoided. On this ſubject it may be remarked, that as the cubical contents of a globe, or any other figure of which balloons are made, increaſe much more rapidly than their ſurfaces, there muſt ultimately be a degree of magnitude at which the ſmalleſt additional heat would raiſe any weight whatever. Thus, ſuppoſing any aeroſtatic machine capable of containing 500 cubic feet, and the air within it to be only one degree hotter than the external atmoſphere; the tendency of this machine to riſe, even without the application of artificial heat, would be near an ounce. Let its capacity be increaſed 16 times, and the tendency to riſe will be equivalent to a pound; and this may be done without making the machine 16 times heavier than before.

It is certain, however, that all aeroſtatic machines have a tendency to produce or preſerve heat within them, as Meſſrs. Charles and Roberts found in their aerial voyage of 150 miles, when the external atmoſphere was 63°, and the thermometer within the balloon at 104°. Such a difference of temperature, affording a power of aſcent equal to 41 grains on every cubic foot, muſt, in a machine of 50,000 ſuch feet, have amounted to almoſt 300 pounds. Hence we may eaſily account for Mr. Morveau's accident at Dijon, when a balloon filled only with common air made its eſcape to ſome diſtance by the ſpontaneous rarefaction of the air within. This difference between the external and internal heat, being ſo very conſiderable, muſt have a great influence upon aeroſtatic machines, and will undoubtedly influence thoſe filled with inflammable air as well as the other kind. The rain, ſnow, and vapours which condenſe upon them in the higher regions, may alſo occaſion an evaporation, and conſequently a very conſiderable degree of cold, ſo as to make them ſpecifically heavier than the atmoſphere.

To this probably, we may aſcribe the deſcent of the balloon which carried Mr. Blanchard and Dr. Jeffries: and which ſeemed ſo extraordinary, that many had recourſe to an imaginary attraction in the waters of the ocean, in order to ſolve the phenomenon. This ſuppoſition, however, is rejected by Cavallo; who explains the matter, by remarking that in two former voyages made with the ſame machine, it could not long ſupport two men in the atmoſphere; ſo that we had no reaſon to wonder at its weakneſs on this occaſion. In fact, it does not appear that the air over the ſea is at all warmer than above land; on the contrary, there is every reaſon to believe, that the ſuperior reflective power of the land renders the atmoſphere above it warmer: but it is very natural to ſuppoſe, that the air above the ſea is more moiſt than that above land; and conſequently, by letting fall its moiſture upon the balloon, muſt have occaſioned an evaporation, that would deprive the machine of its internal heat; which it would partly recover after it entered the warmer and drier atmoſphere over land.

Chap. IV. *Of the* Construction *of* Aerostatic Machines.

With regard to the conſtruction of aeroſtatic machines, whether ſmall for mere amuſement, or large for philoſophical experiments, or other purpoſes, it is neceſſary that they ſhould be made to weigh as little as poſſible. On this account, the form of the machine becomes an object of great conſideration. For this purpoſe, a ſpherical figure has been mathematically demonſtrated to be the beſt; as capable of containing a greater quantity under a ſmaller ſurface than any other; and this holds good with regard to all inflammable air-balloons, whether great or ſmall. But for machines including rarefied air, where the under part muſt neceſſarily be much wider than the upper, an inverted cone, or truncated pyramid, with the ſmall part undermoſt, ſeems to be moſt proper; as it allows the heated air, which has a great tendency to expand, to collect in the wide part at the top, while the viſible ſurface in the lower part, and which in any other figure would contain only the colder and heavier air, is thus thrown aſide. In fact, it was found in the different experiments of M. Montgolfier, that the aeroſtatic machines of rarefied air, when made of the ſhape of a parallelopiped, or even one deviating ſtill more from the ſhape of a globe, anſwered the purpoſe remarkably well.

For experiments, both the inflammable and rarefied air-balloons may be made of paper, the former of that kind called *thin post*; varniſhed over with lindſeed oil; the latter, of what is called *silk* or *silver* paper, without varniſh. Thoſe with inflammable air have been made of gold-beater's leaf, or pealed bladders; but paper is undoubtedly preferable.

The material univerſally employed for aeroſtatic machines of a large ſize, to be filled with inflammable air, is varniſhed ſilk; and for thoſe of the rarefied air kind, linen painted over with ſome ſize colour, or lined with paper. The beſt varniſh for an inflammable air-balloon is that made with bird-lime, and recommended by M. Faujas de St. Fond, in a treatiſe publiſhed on the ſubject. The following is his method of preparing it: "Take one pound of bird-lime, put it into a new proper earthen pot that can reſiſt the fire, and let it boil gently for about one hour, viz. till it ceaſes to crackle; or which is the ſame thing, till it is ſo far boiled, as that a drop of it being let fall upon the fire will burn: then pour upon it a pound of ſpirits of turpentine, ſtirring it at the ſame time with a wooden ſpatula, and keeping the pot at a good diſtance from the flame, leſt the vapour of this eſſential oil ſhould take fire. After this, let it boil for about ſix minutes longer; then pour upon the whole three pounds of boiled oil of nuts, lindſeed, or poppy, rendered dry by means of litharge; ſtir it well, let it boil for a quarter of an hour longer, and the varniſh is made. After it has reſted for 24 hours, and the ſediment has gone to the bottom, decant it into another pot; and when you want to uſe it, warm it, and apply it with a flat bruſh upon the ſilk-ſtuff, whilſt this is kept well ſtretched. One coat of it may be ſufficient: but if two are neceſſary, it will be proper to give one on each ſide of the ſilk, and to let them dry in the open air while the ſilk remains extended."

On this ſubject, however, Mr. Cavallo has made ſome improvements, as may be ſeen in his printed publications. Much likewiſe has been ſaid in France of the elaſtic gum varniſh, and its compoſition kept a ſecret; But Mr. Baldwin, after many expenſive trials, declares it to be made by melting in an iron ladle properly heated, pieces of elaſtic gum, and afterwards ſtirring in a quantity of drying oil. Mr. Blanchard's method of making elaſtic gum varniſh for the ſilk of a balloon, is the following: "Diſſolve elaſtic gum cut ſmall, in five times its weight of ſpirit of turpentine, by keeping them ſome days together; then boil one ounce of this ſolution in eight ounces of drying lintſeed oil for a few minutes; laſtly, ſtrain it. It muſt be uſed warm. The pieces of ſilk, after the varniſh is ſufficiently dry, may be joined by laying about half an inch of the edge of one piece over the edge of the other and ſewing them by a double ſtitch.

The beſt method of cutting the pieces that are to form a balloon, is to deſcribe a pattern of wood, and then to cut the ſilk upon it. As the edges of ſuch a pattern are not perfect ſegments of circles, they cannot be deſcribed by a pair of compaſſes: but the beſt method of drawing them is as follows: 1. Draw on a flat ſurface, two right lines AA and BC, Plate I. fig. 1. perpendicular to each 2. Find the circumference anſwering to the given d of the balloon in feet and decimals of a foot; and m AD and DA each equal to a quarter of the circumfere ſo that the whole length AA of the pattern may be e to half the circumference. 3. Divide AD into 18 parts ; and to the points of diviſion apply the lines *fg*, *hi*, *kl*, &c. parallel to each other, and perpendicular to AD. 4. Divide the whole circumference in twice the given number of pieces, and DC and BD each equal to the quotient of this diviſion ; ſo that the whole, BC is equal to the greateſt breadth of one of theſe pieces. 5. Multiply the above mentioned quotient by the decimals annexed to *fg*, viz. 0.99619, and then the product expreſſes the length of *fg*; again, multiply the ſame length of DA by the decimals annexed to *hi*, and the product expreſſes the length of *hi*; and, in ſhort, the product ariſing from the multiplication of the length of DC by the decimals annexed to each of the parallel lines, gives the length of that line. Laſtly, having found the lengths of all theſe lines, draw by hand a curve line paſſing through all the extremities of the ſaid lines, and that is the edge of one quarter of the pattern. The other quarters may be eaſily deſcribed, by applying to them a piece of paper cut according to that already found. In cutting the pieces after ſuch a pattern, care ſhould be taken to leave them about three quarters of an inch all round larger than the pattern, which will be taken up by the ſeams.

There ſhould be adapted to the upper part of the balloon, a valve opening inwards ; to which ſhould be faſtened a ſtring paſſing through a hole, and faſtened to the car below, ſo that the aeronaut may open the valve when occaſion requires. The action of this valve may be underſtood from fig. 2. A round braſs plate, AB has a round hole CD, about 2 or 3 inches diameter, covered on both ſides with ſtrong ſmooth leather. On the inſide there is a ſhutter E, alſo of braſs, covered with leather which is to cloſe the hole CD ; being about two inches larger in diameter than the hole. It is faſtened to the leather of the plate AB ; and by a ſpring, which need not be very ſtrong, it is kept againſt the hole. The elaſticity of the gas itſelf will help to keep it ſhut. To this ſhutter the ſtring is faſtened, by which it is occaſionally opened for the eſcape of gas. A ſmall ſtring or other ſecurity ſhould be fixed to the ſhutter and the plate, ſo as not to admit the ſhutter to be opened beyond a certain ſafe diſtance. To the lower part two pipes ſhould be fixed, through which the inflammable gas may be introduced into the balloon.

The car or boat is beſt made of wicker work, covered with leather, and painted ; and the proper method of ſuſpending it, is by ropes proceeding from the net which goes over the balloon. This net ſhould be formed of the ſhape of the balloon, and fall down to the middle of it, with various cords proceeding from it to the circumference of a circle, about two feet below the balloon ; and from that circle other ropes ſhould go to the edge of the boat. This circle may be made of wood, or of ſeveral pieces of ſlender cane bound together. The meſhes of the net may be ſmall at top, againſt which part of the balloon, the inflammable air exerts the greateſt force ; and increaſe in ſize as they recede from the top.

With regard to the rarefied air machines, Mr. Cavallo recommends firſt to ſoak the cloth in a ſolution of ſal-ammoniac and common ſize, uſing one pound of each to every gallon of water ; and when the cloth is quite dry, to paint it over in the inſide with ſome earthy colour, and ſtrong ſize or glue. When this paint has dried perfectly, it will then be proper to varniſh it with oily varniſh, which might dry before it could penetrate quite through the cloth. Simple drying lintſeed oil will anſwer the purpoſe as well as any, provided it be not very fluid.

CHAP. V *How to* FILL AIR BALLOONS.

It now only remains to give ſome account of the method by which aeroſtatic machines may be filled ; and here we are able to determine with much greater preciſion concerning the inflammable air balloons than the other kind. With regard to theſe, a primary conſideration is, the moſt effectual and cheap method of procuring the inflammable air. Under the article AEROLOGY it will be found, that the moſt advantageous methods are, by applying acids to certain metals, by expoſing animal, vegetable, and ſome mineral ſubſtances, in a cloſe veſſel to a ſtrong fire : or laſtly, by tranſmitting the vapour of certain fluids through red hot tubes.

Fig. 4. of PLATE I. repreſents an apparatus deſcribed by Mr. Cavallo as proper for filling balloons of the ſize of 2 or 3 feet in diameter with inflammable air, after paſſing it through water.—A is the bottle with the ingredients ; BCD a tube faſtened in the neck at B, and paſſing through C, the cork of the other bottle, in which there is another hole made to receive the tube on which the balloon is tied. Thus it is plain, that the inflammable air coming out of the tube D will paſs firſt through the water of the bottle E, and then into the balloon. Two ſmall caſks may be uſed inſtead of the bottles A and F.

For obtaining inflammable air from pit coal, aſphaltum, amber, &c. &c. Mr. Cavallo recommends the following apparatus : Let a veſſel be made of clay, or rather iron, in the ſhape of a Florence flaſk, but ſome what larger, and whoſe neck is longer and larger ; as BC, Fig. 5. PLATE I. Put the ſubſtance to be uſed into this veſſel, ſo as to fill about four fifths of its cavity B. If the ſubſtance be of ſuch a nature as to ſwell much by the action of the fire, lute a tube of braſs, or firſt a braſs and then a leaden tube, to the neck C of the veſſel ; and let the end D of the tube be ſhaped as in the figure, ſo that going into the water HI, it may terminate under a ſort of inverted veſſel EF, to the upper aperture of which the balloon G is adapted. Things thus prepared, if the part B of the veſſel is put into the fire, and made red hot, the inflammable air produced will come out of the tube CD, and paſſing through the water will at laſt enter into the balloon G. Previous to the operation, as a conſiderable quantity of common air remains in the inverted veſſel EF, which it is more proper to expel, the veſſel EF ſhould have a ſtop cock K, through which the common air may be ſucked out, and the water aſcend as high as the ſtop cock.

To procure inflammable air by means of ſteam, Dr. Prieſtly uſes a tube of red hot braſs, upon which the ſteam of water has no effect, and which he fills with the turnings of iron that are ſeparated in the boring of cannon. By this means he obtains an inflammable air, the ſpecific gravity of which is to that of common air as 1 to 13.

In this method, not yet indeed reduced to general practice, a tube about three quarters of an inch in diameter, and about 3 feet long, is filled with iron turnings ; then the neck of a retort or cloſe boiler, is luted to one of its ends, and the worm of a refrigeratory is adapted to its other extremity.

tremity. The middle part of the tube is then ſurrounded with burning coals, ſo as to keep about one foot in length of it red-hot, and a fire is always made under the retort or boiler, ſufficient to make it boil with vehemence. In this proceſs a conſiderable quantity of inflammable air comes out of the worm of the refrigeratory. It is ſaid that iron yields one half more air by this means than by the common action of vitriolic acid.

For filling large balloons, a greater apparatus is neceſſary; and the only materials that can with any certainty of ſucceſs be employed for producing the proper gas, are, oil of vitriol, and iron filings or turnings. For a balloon of thirty feet in diameter, Mr. Cavallo recommends 3,900 pounds of iron turnings, as much oil of vitriol, and 19,500 pounds of water. Theſe proportions, however, appear too great with reſpect to the acid and metals, and too little with reſpect to the water. Oil of vitriol will not exert its power upon iron, unleſs it be diluted with 5 or 6 times its quantity of water; in which caſe, a much ſmaller quantity of both acid and metal will ſerve. Mr. Lunardi, who, from the number of his voyages had certainly much practical knowledge in aeroſtation, filled his balloon at Edinburgh and Glaſgow, with about 2000 pounds of iron (the borings of cannon procured from Carron,) as much vitriolic acid, and 12,000 pounds of water. The iron was placed in his veſſels in layers, with ſtraw between them in order to increaſe the ſurface. His apparatus was not materially different from that of Mr. Cavallo, repreſented Plate I. Fig. 3. where AA are two tubes, about 3 feet in diameter, and nearly two feet deep, inverted in large tubs BB filled with water. In the bottom of each of the inverted tubs a hole is made, and a tube, E, of tin adapted. To theſe the ſilken ones of the balloon are to be tied. Round each of the tubs B, 5, 6, or more ſtrong caſks are placed; in the top of each two holes are made, and to one of theſe holes a tin tube is adapted, and ſo ſhaped, that, paſſing over the edge of the tub B, and through the water, it may terminate with its aperture under the inverted tub A. The other hole of theſe caſks ſerves for the introduction of materials, and is ſtopped with a wooden plug. When the balloon is to be filled, put the net over it, and let it be ſuſpended as ſhown by C; and having expelled all the common air from it, let the ſilken tubes be faſtened round the tin ones LE; and the materials being put into the caſks, the inflammable air, paſſing into the balloon, will ſoon diſtend, and render it capable of ſupporting itſelf; after which the rope GH may be ſlipped off. As the balloon continues to be filled, the net is adjuſted properly round it; the cords that ſurround it are faſtened to the hoop MN; then the car IK being placed between the two ſets of caſks, is faſtened to the hoop MN, and every thing that is required to be ſent up, as ballaſt, inſtruments, &c. is placed in it.

At laſt, when the balloon is little more than three quarters full, the ſilken tubes are ſeparated from the tin ones of the inverted tubs, and their extremities being tied up, are placed in the car. Laſtly, the aeronauts being ſeated the lateral ropes are ſlipped off, and the machine is let looſe. See *Blanchard's balloon*, Plate I. This apparatus was reduced by Mr. Lunardi to its utmoſt ſimplicity, by uſing only two large caſks, and ſuffering the vapour to go into the balloon without paſſing through the water. Thus his balloon was filled in leſs than half an hour, when before, it had required two hours at leaſt. The ſinking of his caſks in the ground was alſo an additional convenience, as it created no confuſion, and rendered the materials much more eaſily conveyed into them.

With regard to the rarefied air balloons, the method of filling them is by means of a ſcaffold, the breadth of which is at leaſt two thirds of the diameter of the machine, and elevated about 6 or 8 feet above the ground. From the middle of which deſcends a well, riſing 2 or 3 feet above it, and reaching to the ground, furniſhed with a door, thro' which the fire in the well is ſupplied with fuel. The well ſhould be conſtructed of brick, and its diameter ſomewhat leſs than that of the machine. On each ſide of the ſcaffold are erected two maſts, each of which is fixed by ropes, and has a pulley at the top. The machine is to be placed on the ſcaffold, with its neck round the aperture of the well. The rope paſſing over the pulleys of the two maſts, ſerves to lift the balloon about 15 feet above the ſcaffold; and it is kept ſteady, and held down while filling, by ropes paſſing through loops or holes about its equator; theſe ropes may be eaſily diſengaged from the machine, by ſlipping them through the loops when it is able to ſuſtain itſelf. The proper combuſtibles to be lighted in the well, are thoſe which burn quick and clear, rather than ſuch as produce much ſmoke; becauſe it is hot air, and not ſmoke, that is required. Small wood and ſtraw are very fit for this purpoſe. As the current of hot air aſcends, the machine will dilate, and lift itſelf above the ſcaffold and gallery which was covered over. The paſſengers, fuel, inſtruments, &c. are then placed in the gallery. When the machine makes efforts to aſcend, its aperture muſt be brought, by means of the ropes annexed to it, towards the ſide of the well a little above the ſcaffold; the fire place is then ſuſpended in it, the fire lighted in the grate, and the lateral ropes being ſlipped off, the machine is let go. See *Verſailles balloon*, Plate I. It has been determined by accurate experiments, that only one third of the common air can be expelled from theſe large machines; and therefore the aſcending power of the rarefied air in them can be eſtimated, as only equal to half an ounce avoirdupoiſe for every cubic foot.

The conduct of balloons, when conſtructed, filled, and actually aſcending in the atmoſphere, is an object of great importance in the practice of aeroſtation. The method generally uſed, for elevating the ballons with rarefied air, has been the increaſe or diminution of the fire; and this is entirely at the command of the aeronaut, as long as he has any fuel in the gallery. The inflammable air balloons have been generally raiſed or lowered, by diminiſhing their ballaſt, or by letting out ſome of the gas thro' the valve: but the alternate eſcape of the air in deſcending, and diſcharge of the ballaſt for aſcending, will by degrees render the machine incapable of floating, for in the air it is impoſſible to ſupply the loſs of ballaſt, and very difficult to ſupply that of inflammable air. Theſe balloons will alſo riſe or fall by means of the rarefaction or condenſation of the incloſed air, occaſioned by heat and cold, as has been already obſerved.

Oars or wings are the only means of this ſort that have been uſed with any probable ſucceſs; and, as Mr. Cavallo obſerves, they ſeem to be capable of conſiderable improvement, though much is not to be expected from them, when the machine goes at a great rate. They are beſt moved by human ſtrength applied ſimilarly to the oars of a boat. They may be made in general of ſilk, ſtretched between wires, tubes, or ſticks; and, when uſed, muſt be turned edgewiſe, when they are moved in the direction in which the machine is intended to be impelled, but flat in the oppoſite direction. Fig. 6, Plate 1. is the repreſentation of one of Mr. Blanchard's wings. Fig. 7, is one of thoſe uſed by Mr. Lunardi, which conſiſts of many ſilk ſhutters or valves, ABCD, DECF, &c. every one of which opens on one ſide only, viz. ADBC opens upon the ſide AB: DECF opens upon the ſide DC, &c. In conſequence of this conſtruction, this ſort of oars does not need being turned edgewiſe. Fig. 8. repreſents one of the wings uſed by the brothers Roberts; and Fig. 9, one conſtructed by Count Zambeccari, conſiſting of a piece of ſilk ſtretched between 2 tin tubes ſet at an angle; but theſe wings are ſo contrived as to turn edgewiſe of themſelves when they go in one direction.

Other contrivances have been made to direct aeroſtatic machines, but they have moſtly been invented to effect a power upon them as upon a ſhip. It appears, however, that they can have no effect where a machine is moved by the wind alone, becauſe the circumambient air is at reſt in reſpect to the machine. The caſe is quite different with a veſſel at ſea, becauſe the water on which it floats ſtands ſtill while the veſſel goes on; but it muſt be time and experience that can realize the expectations ſuggeſted by theſe inventions.

ÆRUGINOUS, *adj.* ſomething partaking of, or like the ruſt of copper.

ÆRUGO, in natural hiſtory, the ruſt of copper, whether natural or artificial. The former is found in copper-mines, and the latter, called *verdegris*, made by corroding copper-plates with acids. See Verdegris. Dr. Grew ſays, the turcois ſtone is a kind of petrified ærugo. Another ſpecies of natural ærugo is a greeniſh marcaſite, like the drops of iron, found in copper-mines. There is alſo, on ſome mountains in Moravia, a ſort of green grains, like ſand, of a graſs green colour, when uſed in painting, which are called the Hungarian, mountain, or ſea verdegris.

AERY, or Airy, among ſportſmen, the neſt of hawks, or eagles.

ÆS, among the ancient Romans, had various ſignifications. It properly denoted braſs or copper; but as copper was the firſt metal uſed in coinage by the Romans, the word was uſed to ſignify money in general, as well as the particular coin made of that metal.

Æs ustum, a chemical preparation, made of thin leaves of copper, ſulphur, and nitre, placed *stratum super stratum*, in a crucible, and ſet in a charcoal fire till all the ſulphur is conſumed; after which, the copper is taken out of the crucible, and reduced to powder Some quench the leaves of copper in vinegar, and repeat the calcination. Its principal uſe is in colouring glaſs, to which it gives a beautiful tincture. The ſurgeons uſe it as a deterſive, and ſome have given it internally; but it is certainly a very dangerous medicine, and ſhould be avoided.

ÆSALON, in ornithology, a ſpecies of hawk, called in Engliſh the merlin. It is the ſmalleſt of all the hawk kind. It is about the ſize of the blackbird. Its beak is blue, and its eyes hazel; it has a wreath of whitiſh yellow feathers behind its head; its chin is white, and its back and wings of a duſky blackiſh brown. Its larger wing feathers are black, with brown ſpots; and its tail long, and variegated with tranſverſe ſtreaks of black and whitiſh brown; its breaſt and belly are of a whitiſh brown, variegated with blackiſh brown ſpots; its legs are long and yellow. It feeds on partridges and other birds.

ÆSCHYNOMENE, Bastard sensitive plant: A genus of the decandria order, belonging to the diadelphia claſs of plants; the characters of which are: The calyx is a one-leaved campanulated bilabiated perianthium; the lips equal, but the ſuperior one two-cleft, the inferior tridentate. The corolla is papillionaceous; the banner cordated and ſubringent; the alæ ovate, obtuſe, and ſhorter than the banner; and the carina lunated, pointed, and the length of the alæ. The ſtamina conſiſt of ten ſimple nine-cleft filaments; the antheræ are ſmall. The piſtillum is an oblong villous columnar germen; the ſtylus ſubulated and aſcending, the ſtigma ſimple and ſomewhat obtuſe. The pericarpium is a long compreſſed, unilocular jointed pod. The ſeeds are kidney ſhaped, and ſolitary within each joint. Of this genus there are ſix ſpecies, which are all natives of warm countries, viz. Æſchynomene Americana, Æſchynomene Arborea, Æſchynomene Aſpera, Æſchynomene Grandiflora, Æſchynomene Pumila, and Æſchynomene Seſbana. The firſt of theſe, Æſchynomene Americana, or American Æſchynomene, ſeldom riſes more than two feet. The flowers come out from the leaves on branching footſtalks, five or ſix together; not very large, and of a pale yellow colour. The ſeed is lodged in pods, and ſhaped like kidney beans. The different ſpecies of this genus, are propagated from ſeeds, which ſhould be ſown on a hot-bed in the ſpring; and when the plants have ſtrength enough to be removed, they ſhould each be put into a ſeparate pot, filled with light earth, and plunged into hot-beds. As they increaſe in ſize, they muſt be removed into larger pots; but if theſe are two large, the plants will not thrive. They muſt be brought forward early in the year, otherwiſe the firſt kind will not perfect its ſeed.

ÆSCULAPII anguis, in zoology, the name of a harmleſs ſpecies of ſerpent, common in Spain and Italy, called alſo *paræa*.

ÆSCULAPIUS, in aſtronomy, the ancient name for the conſtellation Ophiuchus.

Æsculapius, in the heathen mythology, the god of phyſic.

ÆSCULUS, the Horse-chesnut: A genus of the monogynia order, belonging to the heptandria claſs of plants: The characters are: The calyx is a ſmall, ſingle-leaved, bellied perianthium, divided into five ſegments. The corolla (except in the pavia, where it is four petal'd and cloſe) conſiſts of five roundiſh, flat, expanding petals, unequally coloured, and with narrow claws inſerted into the calyx. The ſtamina have ſeven ſubulated declining filaments, the length of the corolla; the antheræ aſcending. The piſtillum is a roundiſh germen, ending in a ſubulated ſtylus; the ſtigma pointed. The pericarpium is a leathery, roundiſh, trilocular, three-valved capſule. The ſeeds are two, and ſubglobular.—In this genus, Van Rozen and Miller obſerve, both male and hermaphrodite flowers. There are two ſpecies, viz.

1. **Æsculus hippocastanum**, or common horſe-cheſnut.

nut. It was brought from the northern parts of Aſia, about the year 1550, and ſent to Vienna about 1588. This tree makes a noble appearance all the month of May, the extremities of the branches being terminated by fine ſpikes of flowers, ſpotted with roſe colours, ſo that the whole tree ſeems covered with them. It is quick in its growth; and in a few years arrives at a ſize large enough to afford a good ſhade in ſummer, as well as to produce plenty of flowers. It has, however, this great inconvenience, that the wood is of no uſe, being not even fit for burning; and the leaves beginning to fall in July, ſoon deprive the trees of their beauty. There is ſomething very ſingular in the growth of theſe trees: which is, that the whole ſhoot is performed in leſs than three weeks after the buds are opened.—The nuts are reckoned good food for horſes. In Turkey, they are ground, and mixed with the provender of theſe animals, eſpecially thoſe which are troubled with coughs, or broken winded. Deer are alſo very fond of the fruit; and at the time of their ripening keep much about the trees, but eſpecially in ſtrong winds, when the nuts are blown down, which they carefully watch, and greedily devour as they fall.

2. Æsculus Pavia, or ſcarlet flowering horſe-cheſnut, is a native of Carolina, the Braſils, and the Eaſt. It grows to about 15 or 16 feet high; and there is a delicacy in this tree that makes it deſirable. The bark of the young ſhoots is quite ſmooth, and the growing ſhoots in ſummer are of a reddiſh hue. The leaves are palmated, being pretty much like thoſe of the other ſpecies, only much ſmaller, and the indentures at the edges deeper and more acute. The lobes of which they are compoſed are ſpear ſhaped; they are five in number, are united at their baſe, and ſtand on a long red footſtalk. The leaves grow oppoſite by pairs on the branches, which are ſpread abroad on every ſide. The flowers come out from the ends of the branches. The firſt appearance of the buds is in May; though they will not be in full blow till the middle of June. They are of a bright red colour, and conſequently have a pleaſing effect, among the vaſt tribe of yellow flowering ſorts, which ſhew themſelves in bloom at that ſeaſon.

ÆSQUILINUS, one of the ſeven hills, on which ancient Rome was built.

ÆSTIVAL, *adj.* of, or belonging to ſummer.

Æstival Point is that whereby the ſun's aſcent above the equator is determined.

Æstival Signs are thoſe extended from the ſun's greateſt declination northward, to the interſection of the ecliptic and equinoctial ſouthward, including Cancer, Leo, and Virgo. See Astronomy.

ÆSTUARY, Æstuarium, in geography, an arm of the ſea, running up a good way in the land, ſuch as Briſtol channel, in England, &c. See Bay.

Æstuary, in medicine, a vapour bath, or any thing that conveys heat to the body.

ÆTHER, in chemiſtry, the lighteſt, moſt volatile, and moſt inflammable of all liquids, is produced by diſtillation of acids with rectified ſpirit of wine. See Chemistry and Pharmacy.

Æther, in phyſiology, a thin ſubtile matter, much finer and rarer than air; which, commencing from the limits of our atmoſphere, is ſuppoſed to poſſeſs the whole heavenly ſpaces.—Philoſophers cannot conceive that the largeſt part of the creation ſhould be perfectly void; and therefore they fill it with a ſpecies of matter under the denomination of *æther*. But they vary extremely as to the nature and character of this æther. Some conceive it as a body *sui generis*, appointed only to fill up the vacuities between the heavenly bodies; and therefore confined to the regions above our atmoſphere. Others ſuppoſe it of ſo ſubtile and penetrating a nature, as to pervade the air, and other bodies, and poſſeſs the pores and intervals thereof. Others deny the exiſtence of any ſuch ſpecific matter; and think the air itſelf, by that immenſe tenuity and expanſion it is found capable of, may diffuſe itſelf through the interſtellar ſpaces, and be the only matter found therein. In fact, æther, being no object of our ſenſes, but the mere work of imagination, brought only upon the ſtage for the ſake of hypotheſis, or to ſolve ſome phenomenon, real or imaginary, authors take the liberty to modify it as they pleaſe. Some ſuppoſe it of an elementary nature, like other bodies; and only diſtinguiſhed by its tenuity, and the other affections conſequent thereon: which is the philoſophical æther. Others will have it of another ſpecies, and not elementary; but rather a ſort of fifth element, of a purer, more rarefied, and ſpirituous nature, than the ſubſtances about our earth: and void of the common affections thereof, as gravity, &c. Such is the ancient and popular idea of æther, or ætherial matter. The term *æther* being thus embarraſſed with a variety of ideas, and arbitrarily applied to ſo many different things, the later philoſophers chooſe to ſet it aſide, and in lieu thereof ſubſtitute other more determinate ones. Thus the Carteſians uſe the term *materia subtilis*; which is their æther: and Sir Iſaac Newton, ſometimes a ſubtile *spirit*, as in the cloſe of his *Principia*; and ſometimes a *subtile* or *ætherial medium*, as in his *Optics*. The truth is, there are abundance of conſiderations, which ſeem to argue the exiſtence of ſome matter in the air, much finer than the air itſelf. There is an unknown ſomething, which remains behind when the air is taken away; as appears from certain effects which we ſee produced *in vacuo*. Heat, as Sir Iſaac Newton obſerves, is communicated through a vacuum almoſt as readily as through air: but ſuch communication cannot be without ſome interjacent body, to act as a medium. And ſuch body may be ſubtile enough to penetrate the pores of glaſs; and may be very well concluded to permeate thoſe of all other bodies, and conſequently be diffuſed through all the parts of ſpace which anſwers to the full character of an æther. The exiſtence of ſuch an ætherial medium being ſettled, that author proceeds to its properties; inferring it to be only rarer and more fluid than air, but exceedingly more elaſtic and active: in virtue of which properties, he ſhows, that a great part of the phenomena of nature may be produced by it. To the weight, *e. g.* of this medium, he attributes gravitation, or the weight of all other bodies; and to its elaſticity the elaſtic force of the air and of nervous fibres, and the emiſſion, rarefaction, reflection, and other phenomena of light; as alſo, ſenſation, muſcular motion, &c. In fine, according to his theory, æther ſeems to be the *primum mobile*, the firſt force or ſpring of phyſical action in the mundane ſyſtem. The Carteſian æther is ſuppoſed not only to pervade, but adequately to fill, all the vacuities of bodies; and thus to make an abſolute plenum in the univerſe. But

Sir Iſaac Newton overturns this opinion, from divers conſiderations; by ſhowing, that the celeſtial ſpaces are void of all ſenſible reſiſtance: for the matter contained therein muſt be immenſely rare, as the reſiſtance of bodies is chiefly in proportion to their denſity; ſo that if the heavens were thus adequately filled with a medium of matter, how ſubtile ſoever, they would reſiſt the motion of the planets and comets more than quick-ſilver or gold. The late diſcoveries in electricity have thrown great light upon this ſubject, and rendered it extremely probable, that the æther ſo often talked of is no other than the electric fluid, or ſolar light, which diffuſes itſelf throughout the whole ſyſtem of nature. See Electricity, Fire, Heat, Light, &c.

ÆTHERIAL, ſomething that belongs to, or partakes of, the nature of Æther. Thus we ſay, the *ætherial ſpace*, *ætherial regions*, &c.

Ætherial oil, is a fine, ſubtle, eſſential oil, approaching nearly to the nature of a ſpirit. Thus, the pure liquor riſing next after the ſpirit, in the diſtillation of turpentine, is called the ætherial oil of turpentine. Some chemiſts diſtinguiſh two principles in urine: the one a volatile urinous ſalt, reſembling ſpirit of nitre; the other, an ætherial oil, or ſulphur, partaking of the nature of ſpirit of wine.

Ætherial phosphorus, is a name generally given, by Cernouilli, to that otherwiſe called mercurial, or barometrical phoſphorus.

ÆTHIOPIA. See Ethiopia.

ÆTHIOPS Antimonial. See Antimony.

Æthiops Martialis is a preparation firſt introduced into medicine by Mr. Lemery jun. and is made in the following manner: Put filings of ſteel into an unglazed earthen veſſel with water enough to riſe 6 inches above the filings; ſtir it every day and ſupply water as it exhales, ſo as to keep the filings always covered; and continue to do this till a powder of an inky blackneſs be produced, which is called *Martial æthiops.*

Æthiops mineral, *n. s.* a medicine ſo called, from its dark colour, prepared of quick-ſilver and ſulphur, ground together in a marble mortar to a black powder. Such as have uſed it moſt, think its virtues not very great.

ÆTHUSA, in botany, a genus of the pentandria digynia claſs; and, in the natural method, ranking under the 45th order, Umbellatæ. The characters are; The calyx is an univerſal umbel expanding, the interior rays ſhorter by degrees; with a partial umbel, ſmall, and expanding.—There is no univerſal involucrum the partial one is dimidiated, with three or five leaflets, and pendulous; the proper perianthium ſcarcely diſcernible. The univerſal corolla is uniform, with fertile florets; the partial one has five heart-inflected unequal petals. The ſtamina conſiſt of five ſimple filaments, with roundiſh antheræ. The piſtillum is a germen beneath; with two reflected ſtyli; the ſtigmata obtuſe. There is no pericarpium; the fruit is ovate, ſtriated, and tipartite. The ſeeds are two, roundiſh and ſtriated.—There is but one ſpecies, viz. the æthusa synapium, fools-parſley, or leſſer hemlock which grows in corn fields and gardens. This plant, from its reſemblance to common parſley, hath ſometimes been miſtaken for it; and when eaten, it occaſions ſickneſs. But cows, horſes, ſheep, goats, and ſwine, eat it. It is noxious to geeſe.

ÆTIOLOGY, in medicine, a diſcourſe on the cauſe of a diſeaſe. In this ſenſe, we ſay, the ætiology of the ſmall pox, of the hydrophobia, of the gout, the dropſy, &c.

Ætiology, in rhetoric, a figure, whereby, in relating an event, we aſſign alſo the cauſe of it. In this ſenſe, ætiology differs from colour, as the former aſſigns the true cauſe, the latter only a feigned or ſpecious one. The ſceptics were profeſſed opponents of all ætiology, or augmentation from cauſes.

ÆTNA, now *Monte Gibello*: a volcano or burning mountain in Sicily, ſituated in Long. 90. 0. E. Lat. 38. 0. N.

Ætna, ancient accounts of. Diodorus Siculus mentions eruptions of it, as happening 1693 years before the Chriſtian æra. From Homer's ſilence with regard to the phenomena of Ætna, it is to be preſumed that the volcano had been many ages in a ſtate of inactivity; and that no tradition of its burning remained among the inhabitants at the time he compoſed his Odyſſey; perhaps it never had emitted flames ſince the country was peopled. The firſt eruption taken notice of by ancient, but by no means cotemporary authors, happened before the Greeks landed on the iſland, and is ſuppoſed to have ſcared the Sicani from the eaſt part of Sicily. Pindar is the oldeſt writer extant, who ſpeaks of Ætna as a volcano. The firſt recorded eruption was in the time of Pythagoras. Plato was invited by the younger Dionyſius to examine the ſtate of the mountain after the ſixth. It threw up flames and lava near 100 times between that period and the battle of Pharſalia; it was particularly furious while Sextus Pompeius was adding the horrors of war to its devaſtations. Charlemagne happened to be at Catania during one of its eruptions; and from his reign the chronicles mention 15 down to that of the year 1669, the moſt terrible of them all.

Ætna, dimensions of. Concerning the dimenſions of mount Ætna, we can ſcarce extract any thing conſiſtent, even from the accounts of the lateſt and moſt ingenious travellers. Pindar, who lived about 435 years before Chriſt, calls it the *Pillar of Heaven*, on account of its great height. All modern writers likewiſe agree, that this mountain is very high, and very large; but differ exceſſively both as to its height and magnitude; ſome making it no leſs than 12 miles high, others 8, others 6, ſome 4; while Mr. Brydone, and Sir William Hamilton, who lately aſcended to its higheſt ſummit, reduce its height to little more than two miles. No leſs remarkable are the differences concerning its circumference: ſome making it only 60 miles round, others 100; and Signior Recupero, from whom Mr. Brydone had his information in this reſpect, affirms it to be no leſs than 183 miles in circuit. From all which we think we are warranted in aſſerting, that the true dimenſions of this mountain are not as yet known.

Ætna, general appearance of. Concerning the products and general appearance of this volcano, authors are much better agreed.—The journey from Catania to its ſummit has been lately deſcribed by three travelers, M. D'Orville, Mr. Brydone, and Sir William Hamilton. All theſe agree, that this ſingle mountain affords an epitome of the different climates throughout the whole world: towards the foot, it is very hot; farther up, more temperate; and it grows gradually more and more cold the higher we aſcend. At the very top, it is perpetually covered with ſnow: from thence the whole iſland is ſupplied with that article, ſo neceſſary in a hot climate, and without which the natives ſay, Sicily could not be inhabited. So great is the demand for this commodity, that the biſhop's revenues, which are conſiderable, ariſe from the ſale of mount Ætna's ſnow; and he is ſaid to draw $ 4444. a year from one ſmall portion lying on the north ſide of the mountain. Great quantities of ſnow and ice are likewiſe exported to Malta and Italy, making a conſiderable branch of Commerce. On the north ſide of this ſnowy region, Mr. Brydone was aſſured, that there are ſeveral ſmall lakes which never thaw; and that the ſnow mixed with aſhes and ſalt of the mountain are accumulated to a vaſt depth. The quantity of ſalts contained in this mountain, he, with great probability, conjectures to be one reaſon of the preſervation of its ſnow; for ſalt increaſes the coldneſs of ſnow to a ſurpriſing degree. See Cold.

Ætna, mouth of. In the middle of the ſnowy region ſtands the great *crater*, or mouth of Ænta. Sir William Hamilton deſcribes the crater as a little mountain, about a quarter of a mile perpendicular, and very ſteep, ſituated in the middle of a gently inclining plain, of about 9 miles in circumference. It is entirely formed of ſtones and aſhes; and, as Mr. Hamilton was informed by ſeveral people of Catania, had been thrown up about 20 or 30 years before the time (1769) he viſited mount Ætna. Before that, there was only a prodigeous large chaſm, or gulph, in the middle of the above mentioned plain; and it has been remarked that about once in 100 years, the top of Ætna falls in; which undoubtedly muſt be the caſe at certain periods, or the mountain behoved continually to increaſe in height. As this little mountain, though emitting ſmoke from every pore, appeared ſolid and firm, Mr. Hamilton and his companions went up to the very top. In the middle is a hollow, about two miles and a half in circumference, according to Mr. Hamilton; three miles and a half, according to Mr. Brydone; and three or four according to M. D'Orville. The inſide is cruſted over with ſalts and ſulphur of different colours. It goes ſhelving down from the top, like an inverted cone; the depth, in Mr. Hamilton's opinion, nearly correſponding to the height of this little mountain. From many parts of this place iſſue volumes of ſulphureous ſmoke, which being much heavier than the circumambient air, inſtead of aſcending in it, roll down the ſide of the mountain, till, coming to a more denſe atmoſphere, it ſhoots off horizontally, and forms a large tract in the air, according to the direction of the wind; which happily for our travellers, carried it exactly to the ſide oppoſite to which they were placed. In the middle of this funnel is the tremendous and unfathomable gulph ſo much celebrated in all ages, both as the terror of this life, and the place of puniſhment in the next. From this gulph continually iſſue terrible and confuſed noiſes which in eruptions, are increaſed to ſuch a degree, as to be heard at a prodigious diſtance. Its diameter is probably very different at different times: for Mr. Hamilton obſerved, by the wind clearing away the ſmoke from time to time, that the inverted hollow cone was contracted almoſt to a point; while M. D'Orville and Mr. Brydone found the opening very large. Both Mr. Brydone and Mr. Hamilton found the crater too hot to deſcend into it; but M. D'Orville was bolder: and accordingly he and his fellow traveller, faſtened to ropes which two or three men held at a diſtance for fear of accidents, deſcended as near as poſſible to the brink of the gulph; but the ſmall flames and ſmoke which iſſued from it on every ſide, and a greeniſh ſulphur, and pumice ſtones, quite black, which covered the margin, would not permit them to come ſo near as to have a full view. They only ſaw, diſtinctly in the middle, a maſs of matter which roſe, in the ſhape of a cone, to the height of about 60 feet, and which towards the baſe, as far as their ſight could reach, might be 600 or 800. While they were obſerving this ſubſtance, ſome motion was perceived on the north ſide, oppoſite to that whereon they ſtood; and immediately the mountain began to ſend forth ſmoke and aſhes. This eruption was preceded by a ſenſible increaſe of its internal roarings; which, however, did not continue; but after a moment's dilatation, as if to give it vent, the volcano reſumed its former tranquility; but as it was by no means proper to make a long ſtay in ſuch a place, the travellers immediately returned to their attendants. On the ſummit, Mr. Hamilton obſerves, that he was ſenſible of a difficulty in reſpiration from the two great ſubtility of the air, independent of what aroſe from the ſulphureous ſmoke of the mount. In theſe high regions there is generally a very violent wind, which, as all our travellers found it conſtantly blowing from the ſouth, may poſſibly be commonly directed from that point.

Ætna, prospects from. The top of Ætna being above the common region of vapours, the heavens appear with uncommon great ſplendor.—Mr. Brydone and his company obſerved, as they aſcended in the night, that the number of ſtars ſeemed to be infinitely increaſed, and the light of each of them appeared brighter than uſual; the whiteneſs of the milky way was like a pure flame which ſhot acroſs the heavens; and with the naked eye, they could obſerve cluſters of ſtars that were inviſible from below. Had Jupiter been viſible, he is of opinion that ſome of his ſatellites might have been diſcovered with the naked eye, or at leaſt with a very ſmall pocket glaſs. To have a full and clear proſpect from the ſummit of mount Ætna, it is neceſſary to be there before ſun-riſe; as the vapours raiſed by the ſun, in the day time, obſcure every object; and all agree, that the beauty of the proſpect from thence cannot be expreſſed.—Here Mr. Brydone and Mr. Hamilton had a view of Calabria in Italy, with the ſea beyond it; the Lipari iſlands, and Stromboli, a volcano about 70 miles diſtance, appeared juſt under their feet; the whole iſland of Sicily, with its rivers, towns, harbours, &c. appeared diſtinct, as if ſeen on a map. The pyramid ſhadow of the mountain reaches acroſs the whole iſland, and far into the ſea on the other ſide, forming a viſible tract in the air, which, as the ſun riſes above the horizon, is ſhortened, and at leaſt confined to the neighbourhood of Ætna. The moſt beautiful part of the ſcene, however, in Mr. Brydone's opinion, is the mountain itſelf, the iſland of Sicily, and the numerous iſlands lying round it. Theſe laſt ſeem to be cloſe to t ſkirts of Ætna; the diſtance appearing reduced to notl

Ætna, regions of. This mountain is divided three regions, which might properly enough be entitled *torrid*, *temperate*, and *frigid zones*. They are d guiſhed by the names of the *Piedmontese*, or *Regione* the cultivated, or fertile region; the *Sylvosa*, temperate, and the *Regione deserta* the frig region: all theſe are plainly diſtinguiſhed fr

The *Regione deſerta* is marked out by a circle of ſnow and ice, which extends on all ſides to the diſtance of about 8 miles, beginning at the foot of the crater. Greateſt part of this region is ſmooth and even. This is immediately ſucceeded by the *Sylvoſa*, or woody region; which forms a circle of the moſt beautiful green, ſurrounding the mountain on all ſides. The circumference of this zone, or great circle, is every where ſucceeded by the *Regione culta;* which is much broader than the reſt, and extends on all ſides to the foot of the mountain. Here terrible devaſtations are ſometimes committed by the eruptions; and the whole region is likewiſe full of conical mountains thrown up by them. This region is bounded by the ſea to the ſouth and ſouth eaſt; and on all other ſides, by the river Semetus and Alcantara, which form the boundaries of mount Ætna. From M. D'Orville's and Mr. Brydone's accounts, we muſt reckon this part of the mountain pretty ſteep; but Mr. Hamilton ſays, that the aſcent was ſo gradual, as not to be in the leaſt fatiguing; and had it not been for the ſnows, they might have rode on their mules to the very foot of the crater. The woody region deſcends 8 or 9 miles below the *Regione deſerta*, but differs greatly in the temperature of its climate. Mr. Hamilton obſerved a gradual decreaſe of the vegetation as he advanced; the under part being covered with large timber trees, which grew gradually leſs as he approached the third region, at laſt they degenerated into the ſmall plants of the northern climates. He alſo obſerved quantities of juniper aud tanſey; and was informed by his guide, that towards the fall of the year there are a great many curious plants, and in ſome places rhubarb and ſaffron in great plenty. In Carrera's hiſtory of Catania, there is a liſt of all the plants and herbs of Ætna, in alphabetical order. This region is extolled by Mr. Brydone as one of the moſt delightful ſpots on earth. He lodged for a night in a large cave near the middle, formed by one of the moſt ancient lavas. It is called *La Spelonca del Capriole*, or the goats cavern; becauſe it is frequented by thoſe animals, which take refuge there in bad weather. Here his reſt was diſturbed by a mountain thrown up in the eruption 1766. It diſcharged great quantities of ſmoke, and made ſeveral exploſions like heavy cannon fired at a diſtance; but they could obſerve no appearance of fire. This gentleman likewiſe viſited the eaſtern ſide of *Regione Sylvoſa,* intending to have aſcended that way to the ſummit, and deſcended again on the ſouth ſide to Catania; but he found it impracticable; though what the inſurmountable difficulties were, he does not mention. On this ſide, part of the woody region was deſtroyed in 1755, by an immenſe torrent of boiling water, which iſſued from the great crater. Its traces were ſtill very viſible, about a mile and a half broad, and in ſome places more. The ſoil was then only beginning to recover its vegetative power, which it ſeems this torrent had deſtroyed for 14 years.—Near this place are ſome beautiful woods of cork, and evergreen oak, growing abſolutely out of the lava, the ſoil having hardly filled the crevices; and not far off, our traveller obſerved ſeven little mountains that ſeemed to have [illegible] formed by a late eruption. Each of theſe had a [illegible], or crater, on the top; and, in ſome, the mid[illegible] or *Vo*[illegible]*ne*, as the Sicilians call it, was ſtill open. [illegible] Mr. Brydone tumbled down ſtones and he[illegible] for a long time after.

The Piedmonteſe diſtrict is covered with towns villages, monaſteries, &c. and is well peopled, notwithſtanding the danger of ſuch a ſituation; but the fertility of the ſoil tempts the people to inhabit that country; and their ſuperſtitious confidence in their ſaints, with the propenſity mankind have to deſpiſe danger which they do not ſee, render them as ſecure there as in any other place. Here, Sir William Hamilton obſerves, they keep their vines low, contrary to the cuſtom of thoſe who inhabit mount Veſuvius; and they produce a ſtronger wine, but not in ſuch abundance: here alſo many terrible eruptions have burſt forth; particularly one in 1669. At the foot of the mountain raiſed by that eruption, is a hole, through which Sir William Hamilton deſcended, by means of a rope, into ſeveral ſubterraneous caverns, branching out and extending much farther than he choſe to venture, the cold there being exceſſive, and a violent wind extinguiſhing ſome of the torches. Many other avenues are known in this and the other regions of Ætna; ſome of which are made uſe of as magazines for ſnow; which they are well adapted for, on account of their extreme cold. Theſe are with great probability ſuppoſed by Sir William Hamilton, to be the hollows made by the iſſuing of the lava in eruptions. In this region the river *Acis*, ſo much celebrated by the poets, in the fable of Acis and Galatea, takes its riſe. It burſts out of the earth at once in a large ſtream, runs with great rapidity, and about a mile from its ſource throws itſelf into the ſea. Its water is remarkably clear; and ſo extremely cold, that it is reckoned dangerous to drink it; it is ſaid, however, to have a poiſonous quality, from being impregnated with vitriol; in conſequence of which cattle have been killed by it. It never freezes, but is ſaid often to contract a greater degree of cold than ice.

ÆTNA, SIGNS *of eruptions from.* Having thus given an account of this mountain in its quiet and peaceable ſtate, we muſt now deſcribe the appearance it puts on previous to and during the time of an eruption, when it ſpreads deſtruction for many miles round, and is capable of ſtriking the boldeſt with terror. Sir William Hamilton, who has examined both Veſuvius and Ætna in a very accurate manner, never had an opportunity of ſeeing an eruption of the latter; but as he is of opinion, that the two volcanoes agrees perfectly in all reſpects, only that the latter is on a much larger ſcale than the former, it may not be unacceptable to our readers, to give an account of ſome of the general appearances of Veſuvius, when in a ſtate of eruption, to enable them to form ſome idea concerning Ætna. It has been already obſerved, that a ſmoke conſtantly iſſues from the top of Ætna, and that its infernal noiſe never ceaſes. The caſe is, the ſame with Veſuvius: and Sir William Hamilton obſerved, that in bad weather the ſmoke was more conſiderable, as well as the noiſes much louder, than when it was fair; ſo that in bad weather he had frequently heard the inward exploſions of the mountain at Naples ſix miles diſtant from Veſuvius. He alſo obſerved the ſmoke that iſſued from the mountain in bad weather to be very white, moiſt, and not near ſo offenſive as the ſulphureous ſtreams from various cracks in the ſide of the mountain. The firſt ſymptom of an approaching eruption is an increaſe of the ſmoke in fair weather: after ſome time, a puff of black ſmoke is frequently ſeen to ſhoot up in the midſt of the white, to a conſiderable height. Theſe puffs are attended with conſiderable exploſions: for while Veſuvius was in this ſtate, Sir William Hamilton went up to its top, which was covered with ſnow: and perceiving a little hillock of ſulphur, about ſix feet high, which had been lately thrown up, and burnt with a blue flame at the top, he was examining this phenomenon, when ſuddenly a violent report was heard, a column of black ſmoke, ſhot up with violence, and was followed by a reddiſh flame. Immediately a ſhower of ſtones fell; upon which he thought proper to retire. Phenomena of this kind in all probability, precede the eruptions of Ætna in a much greater degree.—The ſmoke at length appears wholly black in the day, and in the night has the appearance of flame; ſhowers of aſhes are ſent forth, earthquakes are produced, the mountain diſcharges volleys of red hot ſtones to a great height in the air. The force by which theſe ſtones are projected, as well as their magnitudes, ſeems to be in proportion to the bulk of the mountain. Signior Recupero aſſured Mr. Brydone, that he had ſeen immenſely large ones thrown perpendicularly upwards to the height of 7000 feet, as he calculated from the time they took to arrive at the earth after beginning to deſcend from their greateſt elevation. The largeſt rock, that was ever known to be emitted by Veſuvious, was 12 feet long and 45 in circumference. This was thrown a quarter of a mile; but much larger ones have been thrown out of mount Ætna, almoſt in the proportion in which the latter exceeds Veſuvious in bulk. Along with theſe terrible ſymptoms, the ſmoke that iſſues from the crater is ſometimes in a highly electrified ſtate. In this caſe, the ſmall aſhes which are continually emited from the crater, are attracted by the ſmoke, and riſe with it to a great height, forming a vaſt black, and to appearance denſe column; from this column continual flaſhes of forked or zig-zag lightning iſſue, ſometimes attended with thunder, and ſometimes not, but equally powerful with ordinary lightning. This phenomenon was obſerved by Sir William Hamilton in the ſmoke of Veſuvius, and has alſo been taken notice of in that of Ætna; and where this electrified ſmoke hath ſpread over a tract of land, much miſchief has been done by the lightning proceeding from it. When theſe dreadful appearances have continued ſometimes four or five months, the *lava* begins to make its appearance. This is a ſtream of melted mineral matters, which, in Veſuvius commonly boils over the top, but very ſeldom does ſo in Ætna; owing to the great weight of the lava, which long before it can be raiſed to the vaſt height of mount Ætna, burſts out through ſome weak place in its ſide. Upon the appearance of the lava, the violent eruptions of the mountain generally, though not always, ceaſe; for if this burning matter gets not ſufficient vent, the commotions increaſe to a prodigious degree.—In the night the lava appears like a ſtream of fire, accompanied with flame; but in the day it has no ſuch appearance: its progreſs is marked by a white ſmoke, which by the reflection of the red hot matter in the night aſſumes the appearance of flame.

ÆTNA, TERRIBLE ERUPTIONS OF. All the abovementioned ſymptoms preceded the great eruption of Ætna, in 1669. For ſeveral months before the lava broke forth, the *old mouth*, or great crater on the ſummit, was obſerved to ſend forth great quantities of ſmoke and flame; the top had fallen in, ſo that the mountain was much lowered; the iſlands alſo of Volcano and Stromboli, two volcanoes to the weſtward of Sicily, were obſerved to range more than uſual. Eighteen days before the eruption, the ſky was very thick and dark, with thunder, lightning, frequent concuſſions of the earth, and dreadful ſubterraneous bellowings. On the 11th of March, ſome time before the lava got vent, a rent was opened in the mountain 12 miles in length, into which when ſtones were thrown, they could not be heard to ſtrike the bottom. Burning rocks, 15 feet in length, were thrown to the diſtance of a mile; others of a leſs ſize were carried three miles off; the internal noiſes of the mountain were exceedingly dreadful, and the thunder and lightning from the ſmoke ſcarce leſs terrible. When the lava at laſt got vent, it burſt out of a vineyard, 20 miles below the great crater, and ſprung up into the air to a conſiderable height. Here it formed a mountain of ſtones and aſhes, not leſs, as Sir William Hamilton conjectures, than half a mile perpendicular in height, and 3 miles in circumference. For 54 days neither ſun nor ſtars had appeared; but ſoon after the lava got vent, the mountain became very quiet. The dreadful effects of this fiery ſtream may be imagined from its amazing extent, being no leſs than 14 miles long, and in many places 6 in breadth. In its courſe, it deſtroyed the habitations of near 30,000 perſons; and meeting with a lake four miles compaſs, it not only filled it up, though ſeveral fathoms deep, but made a mountain in the place of it. A deſcription of the lava iſſuing from Mount-Ætna, in 1669, was ſent to the court of England by Lord Winchelſea, who at that time happened to be at Catania in his way home from an embaſſy at Conſtantinople. The following is an extract from his account.

"When it was night, I went upon two towers in divers places; and I could plainly ſee, at ten miles diſtance, as we judged, the fire begin to run from the mountain in a direct line, the flame to aſcend as high and as big as one of the greateſt ſteeples in your Majeſty's kingdoms, and to throw up great ſtones into the air; I could diſcern the river of fire to deſcend the mountain, of a terrible fiery or red colour, and ſtones of a paler red to ſwim thereon, and ſome to be as big as an ordinary table. We could ſee this fire move in ſeveral other places, and all the country covered with fire, aſcending with great flames in many places, ſmoking like a violent furnace of iron melted, making a noiſe with the great pieces that fell, eſpecially thoſe that fell into the ſea. A cavalier of Malta, who lives there, and attended me, told me, that the river was as liquid, where it iſſues out of the mountain, as water, and came out like a torrent with great violence, and is 5 or 6 fathoms deep, and as broad, and that no ſtones ſink therein." The account given in the Philoſophical Tranſactions is to the ſame purpoſe. We are there told, that the lava is "nothing elſe but diverſe kinds of metals and minerals, rendered liquid by the fierceneſs of the fire in the bowels of the earth, boiling up and guſhing forth as the water doth at the head of ſome great river; and having run in a full body for a ſtone's caſt or more, began to cruſt or curdle, becoming, when cold, thoſe hard porous ſtones which the people called *Sciarri*." Thoſe, tho' cold in compariſon of what firſt iſſues from the mountain, yet retained ſo much heat, as to reſemble huge cakes of ſea coal ſtrongly ignited, and came tumbling over one another, bearing down or burning whatever was in their way. In

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this manner the lava proceeded ſlowly on till it came to the ſea, when a moſt extraordinary conflict enſued betwixt the two adverſe elements. The noiſe was vaſtly more dreadful than the loudeſt thunder, being heard through the whole country to an immenſe diſtance; the water ſeemed to retire and diminiſh before the lava, while clouds of vapour darkened the ſun. The whole fiſh on the coaſt were deſtroyed, the colour of the ſea itſelf was changed, and the tranſparency of its waters loſt for many months. While this lava was iſſuing in ſuch prodigious quantity, the merchants, whoſe account is recorded in the Philoſophical Tranſactions, attempted to go up to the mouth itſelf; but durſt not come nearer than a furlong, leſt they ſhould have been overwhelmed by a vaſt pillar of aſhes, which aſcended the air to an immenſe height; at the mouth itſelf was a continual noiſe, like the beating of great waves of the ſea againſt rocks, or like diſtant thunder, which ſometimes was ſo violent as to be heard 60, or even 100 miles off; to which diſtance alſo part of the aſhes were carried. Some time after, having gone up, they found the mouth from whence this terrible deluge iſſued to be only a hole about 10 feet diameter. This is alſo confirmed by Mr. Brydone; and is probably the ſame through which Sir W. Hamilton deſcended into the ſubterraneous caverns already mentioned. Since 1669, there have been ſeveral eruptions, but none of them comparable to it. In that which happened in the year 1766, the lava ſprung up into the air to a conſiderable height, twelve miles below the ſummit; but formed a ſtream only ſix miles in length, and one mile in breadth. The laſt eruption happened in 1787. From the 1ſt to the 10th of July, there were ſigns of its approach. On the 11th, after a little calm, there was a ſubterraneous noiſe, like the ſound of a drum in a cloſe place, and it was followed by a copious burſt of black ſmoke. It was then calm till the 15th, when the ſame prognoſtics recurred. On the 17th, the ſubterraneous noiſe was heard again; the ſmoke was more abundant, ſlight ſhocke of an earthquake followed, and the lava flowed from behind one of the little mountains which form the double head of Ætna. On the 18th, while the ſpectators were in anxious expectation of a more ſevere eruption, all was quiet, and continued ſo for more than 12 hours: ſoon after they perceived ſome new ſhocks, accompanied with much noiſe; and the mountain threw out a thick ſmoke, which, as the wind was weſterly, ſoon darkened the eaſtern horizon: two hours afterwards a ſhower of fine black brilliant ſand deſcended: on the eaſt ſide it was a ſtorm of ſtones; and, at the foot of the mountain, a deluge of flaſhes of fire, of ſcoriæ and lava. Theſe appearances continued the whole day; at the ſetting of the ſun, the ſcene changed. A number of conical flames roſe from the volcano; one on the north, and another on the ſouth, were very conſpicuous, and roſe and fell alternately. At 3 in the morning, the mountain appeared cleft, and the ſummit ſeemed a burning maſs. The cones of light which aroſe from the crater were of an immenſe extent, particularly the two juſt mentioned. The two heads ſeemed to be cut away; and at their ſeparation was a cone of flame, ſeemingly compoſed of many leſſer cones. The flame ſeemed to be two miles high, on a baſe of a mile and a half in diameter. This cone was ſtill covered with a very thick ſmoke, in which there appeared very brilliant flaſhes of lightning, a phenomena which Ætna had not before afforded. From the cone, as from a fountain, a jet of many flaming volcanic matters were thrown, which were carried to the diſtance of 6 or 7 miles: from the baſe of the cone a thick ſmoke roſe, which, for a moment, obſcured ſome part of the flame, at the time when the rivers of lava broke out. This beautiful appearance continned three quarters of an hour. It began the next night with more force; but continued only half an hour. In the intervals, however, Ætna continued to throw out flames, ſmoke, ſtones ignited, and ſhowers of ſand. From the 20th to the 22d, the appearances gradually ceaſed. The ſtream of lava was carried towards Bronte and the plain of Lago. After the eruption, the top of the mountain on the weſtern ſide was found covered with hardened lava, ſcoriæ and ſtones. The travellers were annoyed by ſmoke, by ſhowers of ſand, mephitic vapours, and exceſſive heat. They ſaw that the lava which came from the weſtern point divided into two branches, one of which was directed towards Libeccio; the other, as we have already ſaid, towards the plain of Lago. The lava on the weſtern head of the mountain, had from its various ſhapes been evidently in a ſtate of fuſion; from one of the ſpiracula, the odour was ſtrongly that of liver of ſulphur. The thermometer, in deſcending, was at 40 degrees of Farenheit's ſcale; while near the lava, in the plain of Lago, it was 140 degrees. The lava extended 2 miles; its width was from 13 feet and 3 fourths to 21, and its depth 13 feet and 3 fourths. Theſe are the moſt remarkable circumſtances we have been able to collect, reſpecting this famous mountain.—Many things concerning the lava, &c. remain to be diſcuſſed, as will as concerning the internal fire which produces ſo much miſchief: but theſe belong to the article VOLCANO, to which the reader is referred.—See alſo CATANIA, HYBLA, and VESUVIUS.

ÆTOLIA, in ancient geography, a region of Achaia, between Arcania and Phocis, ſituated in the middle of Greece.

AFAR, *adv.* at a great diſtance. See FAR.

AFEARD, *part. adj.* frighted; terrified; afraid.

AFER, *n. s.* the ſouth-weſt wind.

AFFABILITY, *n. s.* the quality of being affable; eaſineſs of manners; courteouſneſs; civility; condeſcenſion.

AFFABLE, *adj.* 1. Eaſy of manners; accoſtable; courteous; complaiſant.—2. Benign; mild; favourable.

AFFABLENESS, *n. s.* courteſy; affability.

AFFABLY, *adv.* in an affable manner; courteouſly; civilly.

AFFABROUS, *adj.* ſkilfully made; complete; finiſhed in a workman-like manner.

AFFABULATION, *n. s.* the moral of a fable.

AFFAIR, *n. s.* buſineſs; ſomething to be managed or tranſacted.

To AFFEAR, *v. n.* to confirm; to give a ſanction to; to eſtabliſh; an old term of law.

AFFECT, *n. s.* 1. Affection; paſſion; ſenſation.—2. Quality; circumſtance.

To AFFECT, *v. a.* 1. To act upon; to produce effects in any other thing.—2. To move the paſſions.—3. To aim at; to endeavour after; ſpoken of perſons.—4. To tend to; to endeavour after; ſpoken of things.—5. To be fond of; to be pleaſed with; to love; to regard with fondneſs.—6. To make

make a ſhew of ſomething; to ſtudy the appearance of any thing; with ſome degree of hypocriſy.—7. To imitate in an unnatural and conſtrained manner.—8. To convict of ſome crime; to attaint with guilt: a phraſe merely juridical.

AFFECTATION, *n. s.* 1. Fondneſs; high degree of liking; commonly with ſome degree of culpability.—2. An artificial ſhew; an elaborate appearance; a falſe pretence.

AFFECTED, *part. adj.* 1. Moved; touched with affection; internally diſpoſed or inclined.—2. Studied with over much care, or with hypocritical appearance.—3. Full of affectation; as, *an affected lady*,

AFFECTEDLY, *adv.* in an affected manner; hypocritically; with more appearance than reality.—2. Studiouſly; with laboured intention.

AFFECTEDNESS, *n. s.* the quality of being affected, or of making falſe appearances.

AFFECTIO Bovina, a diſeaſe incident to black cattle, occaſioned by a little worm, bred between the fleſh and the ſkin; which works its way over all parts of the body.

AFFECTION, *n. s.* 1. The ſtate of being affected by any cauſe, or agent.—2. Paſſion of any kind.—3. Love; kindneſs; good-will to perſons.—4. Good-will to any object; zeal; paſſionate regard.—5. State of the mind in general.—6. Quality; property.—7. State of the body, as acted upon by any cauſe.—8. Lively repreſentation in painting.

Affection, in a philoſophical ſenſe, implies an attribute inſeparable from its ſubject. Thus magnitude, figure, weight, &c. are affections of all bodies; and love, fear, hatred, &c. are affections of the mind. Affection, ſignifying a ſettled bent of mind towards a particular being or thing, occupies a middle ſpace between *diſpoſition* on the one hand, and *paſſion* on the other. It is diſtinguiſhable from diſpoſition, which being a branch of one's nature, originally, muſt exiſt before there can be an opportunity to exert it upon any particular object; whereas Affection can never be original, becauſe, having a ſpecial relation to a particular object, it cannot exiſt till the object have once at leaſt been preſented. It is alſo diſtinguiſhed from Paſſion, which, depending on the real or ideal preſence of its object, vaniſhes with its object: whereas Affection is a laſting connection; and, like other connections, ſubſiſts even when we do not think of the perſon. A familiar example will illuſtrate this. There may be in one perſon's mind a diſpoſition to gratitude, which, through want of an object, happens never to be exerted; and which therefore is never diſcovered even by the perſon himſelf. Another, who has the ſame diſpoſition, meets with a kindly office that makes him grateful to his benefactor: An intimate connection is formed between them, termed *affection*: which, like other connections, has a permanent exiſtence, though not always in view. The affection for the moſt part, lies dormant, till an opportunity offer for exerting it; in that circumſtance, it is converted into paſſion of gratitude; and the opportunity is eagerly ſeized of teſtifying gratitude in the warmeſt manner.

Affection, in medicine, the ſame diſeaſe.

AFFECTIONATE, *adj.* 1. Full of affection; ſtrongly moved; warm; zealous.—2. Strongly inclined to; diſpoſed to.—3. Fond.—4. Benevolent; tender.

AFFECTIONATELY, *adv.* in an affectionate manner; fondly; tenderly; benevolently.

AFFECTIONATENESS, *n. s.* the quality or ſtate of being affectionate; fondneſs; tenderneſs; good will; benevolence.

AFFECTIONED, *adj.* 1. affected; conceited. This ſenſe is now obſolete.—2. Inclined; mentally diſpoſed.

AFFECTIOUSLY, *adv.* in an affecting manner.

AFFECTIVE, *adj.* that which affects; that which ſtrongly touches. It is generally uſed for painful.

AFFECTUOSITY, *n. s.* paſſionateneſs.

AFFECTUOUS, *adj.* full of paſſion; as an affectuous ſpeech: a word little uſed.

To AFFERE, *v. a.* a law term, ſignifying to confirm.

AFFETTUOSO, or Con Affetto, in the Italian muſic, intimates that the part to which it is added ought to be played in a tender moving way, and conſequently rather ſlow than faſt.

AFFIANCE, *n. s.* 1. A marriage contract.—2. Truſt in general; confidence; ſecure reliance.—3. Truſt in the divine promiſes and protection. To this ſenſe it is now almoſt confined.

To Affiance, *v. a.* 1. To betroth; to bind any one by promiſe of marriage.—2. To give confidence.

AFFIANCER, *n. s.* he that makes a contract of marriage between two parties.

AFFIDATION, } *n. s.* mutual contract; mutual oath
AFFIDATURE, } of fidelity.

AFFIDAVIT, *n. s.* a declaration.

AFFIED, *participle adj.* jointly by contract; affianced.

AFFILIATION, *n. s.* adoption; the act of taking a ſon.

AFFINAGE, *n. s.* the act of refining metals by the cupel.

AFFINED, *adj.* joined by affinity to another; related to another.

AFFINITY, *n. s.* 1. Relation by marriage; relation contracted by the huſband to the kindred of the wife, and by the wife to thoſe of the huſband. It is oppoſed to *conſanguinity*, or relation by birth.

Affinity, by the lawyers, is more particularly derived, from the two Latin words, *ad* to, and *finis*, a boundary or limit, on account that the two families by marriage approach each other's boundaries. The canon law diſtinguiſhes three ſpecies of affinity: 1. The firſt contracted between the huſband and the relations by blood of his wife; and between the wife and the relations by blood of her huſband. The ſecond between the huſband and thoſe related to his wife by marriage; and the wife, and thoſe ſo related to her huſband. The third, between the huſband and the relations of his wife's relations; and the wife and the relations of her huſband's relations. By the fourth council of Lateran, held in 1213, it was decreed, that none but the firſt kind was any real affinity, the two laſt being mere refinements, which ought to be ſet aſide. The degrees are reckoned after the ſame manner in affinity as in conſanguinity; and therefore differently in the canon law from what they are in the civil law. Whatever line or degree of conſanguinity the kindred of one of the parties are married in, they are in the ſame line and degree of affinity to the other. And again, in whatever line or degree of affinity perſons are, in the firſt kind, they are in the ſame in the ſecond and third kinds of affinity. Hence ariſe what we may call a direct and collateral, an aſcending and deſcending line of affinity. Affinity does not found any real kinſhip; it is a kind of fiction, introduced on account of the cloſe relation between huſband and wife. It is even ſaid, in law, to ceaſe when the cauſe of it ceaſes. Yet with regard to the contracting marriage, affinity is not diſſolved by death, though it be in every thing elſe; for a man is not allowed to marry the widow of his father, brother, or ſon; ſuch connections being conſidered as inceſtuous, nearly as much as if they were formed with the blood relations of the ſame degree.

Affinity, degrees of. The degrees and denominations of affinity are chiefly, 1. father-in-law, i. e. huſband's or wife's father: 2. ſtep-father, i. e. mother's huſband; 3. mother-in-law, i. e. huſband's or wife's mother; 4. ſtep-mother, i. e. father's wife; 5. ſon-in-law, i. e. daughter's huſband; 6. daughter-in-law, i. e. ſon's wife; 7. ſtep-ſon, i. e. huſband's or wife's ſon by a former marriage; 8. ſtep-daughter, i. e. huſband's or wife's daughter by former marriage. Theſe four laſt degrees are often confounded, and miſtaken for each other; the ſtep-ſon, being called ſon-in-law, and the ſtep-daughter, daughter-in-law, *et vice verſa,* although no degrees of relationſhip are more diſtinct. 9. Brother-in-law, i. e. huſband's brother, ſiſter's huſband, or wife's brother; 10. ſiſter-in-law, i. e. huſband's or wife's ſiſter, or brother's wife. All theſe degrees are prohibited from intermarrying: to which may be added, 11. The uncle-in-law, i. e. the aunt's huſband; 12. the aunt-in-law, i. e. the uncle's wife; the nephew-in-law, i. e. the niece's huſband; and, 14. the niece-in-law, i. e. the nephew's huſband, on either ſide.

Affinity, in chemiſtry, a term which correſponds to attraction in the mechanical philoſophy, and denotes the tendency which the conſtituent parts of bodies have to unite, and the power by which they adhere when united. It is now more generally called *elective attraction.* See Chemistry.

Affinity, spiritual, in the church of Rome, is contracted by the ſacrament of baptiſm and confirmation. In that church, a god-father may not marry with his god-daughter, without a diſpenſation.

To AFFIRM, *v. a.* 1. To declare poſitively; as, to *affirm* a fact.—2. To ratify or approve a former law, or judgment: oppoſed to *reverſe* or *repeal.*

To Affirm, *v. n.* to declare; to tell confidently: oppoſed to the word *deny.*

AFFIRMABLE, *adj.* that which may be affirmed.

AFFIRMANCE, *n. s.* confirmation: oppoſed to *repeal.*

AFFIRMANT, *n. s.* the perſon who affirms; a declarer.

AFFIRMATION, *n. s.* 1. The act of affirming or declaring; oppoſed to negation or denial.—2. The poſition affirmed.—3. Confirmation: oppoſed to *repeal.*

Affirmation, is alſo uſed in grammar, by ſome refiners in that art, for what is uſually called a verb; becauſe the office of that part of ſpeech is to expreſs what we affirm, or attribute to any ſubject.

Affirmation, in law, ſignifies the ratifying or confirming a former judgment. The word affirmation alſo denotes an indulgence allowed to the people called Friends, who, in caſes where an oath is required from others, may make a ſolemn affirmation, that what they ſay is true; and, if they make a falſe affirmation, they are ſubject to the penalties of perjury.

Affirmation, in logic, a poſitive propoſition, alledging, the truth or reality of ſomething. See Logic.

AFFIRMATIVE, *adj.* 1. That which affirms, oppoſed to *negative.*—2. That which can or may be affirmed; a ſenſe uſed chiefly in ſcience.—3. Poſitive; dogmatical.

Affirmative, in grammar. Authors diſtinguiſh affirmative particles, ſuch as *yes,* from *negative,* ſuch as *no.* The term affirmative is ſuppoſed to be alſo uſed ſubſtantively, becauſe we ſay, the affirmative is the more probable ſide of the queſtion: there were ſo many votes, or voices, for the affirmative, &c. But this is a miſtake, the word being clearly an adjective in all ſuch inſtances; where *ſide* or ſome other ſubſtantive is underſtood.

AFFIRMATIVELY, *adv.* in an affirmative manner; on the poſitive ſide; not negatively.

AFFIRMER, *n. s.* the perſon who affirms.

To AFFIX, *v. a.* 1. To unite to the end, or *à poſteriori;* to ſubjoin.—2. To connect conſequentially—3. Simply to faſten or fix; obſolete.

AFFIXION, *n. s.* 1. The act of affixing.—2. The ſtate of being affixed.

AFFLATION, *n. s.* the act of breathing upon any thing.

AFFLATUS, *n. s.* from the Latin words *ad,* to, and *flare,* to blow; a blaſt of wind, breath or vapour, ſtriking with force againſt another body. Hence the word uſed figuratively, ſignifies divine inſpiration: communication of the power of prophecy.

To AFFLICT, *v. a.* to put to pain; to grieve; to torment.

AFFLICTEDNESS, *n. s.* the ſtate of affliction, or of being afflicted; ſorrowfulneſs; grief.

AFFLICTER, *n. s.* the perſon who afflicts.

AFFLICTION, *n. s.* 1. The cauſe of pain or ſorrow; calamity.—2. The ſtate of ſorrowfulneſs; miſery; oppoſed to proſperity.

AFFLICTIVE, *adj.* that which cauſes affliction; painful; tormenting.

AFFLUENCE, or Affluency, *n. s.* the act of flowing to any place; concourſe.

AFFLUENT, *adj.* 1. Flowing to any part.—2. Abundant; exuberant; wealthy.

AFFLUENTNESS, *n. s.* the quality of being affluent.

AFFLUX, *n. s.* 1. The act of flowing to ſome place; affluence.—2. That which flows to another place.

AFFLUXION, *n. s.* 1. The act of flowing to a particular place.—2. That which flows from one place to another.

To AFFORD, *v. a.* 1. To yield or produce.—2. To grant or confer any thing.—3. To be able to ſell.—4. To be able to bear expences.

To AFFRANCHISE, *v. a.* to make free.

To AFFRAY, *v. a.* to fright; to terrify; to ſtrike with fear. The word is not now in uſe.

Affray, or Affrayment, *n. s.* a tumultuous aſſault of one or more perſons upon others, a law term. A battle: in this ſenſe it is written *fray.*

AFFREIGHTMENT, in law, ſignifies the freight of a ſhip.

AFFRICTION, *n. s.* the act of rubbing one thing upon another.

AFFRIGHT, *n. s.* 1. Terror; fear.—2. The cauſe of fear; a terrible object; dreadful appearance.

To Affright, *v. a.* to affect with fear; to terrify. It generally implies a ſudden impreſſion of fear.

AFFRIGHTFUL, *adj.* full of affright or terror; terrible; dreadful.

AFFRIGHTMENT, *n. s.* 1. The impreſſion of fear; terror.—2. The ſtate of fearfulneſs.

AFFRONT, *n. s.* 1. Inſult offered to the face; contemptuous or rude treatment; contumely.—2. Outrage; act of contempt.—3. Open oppoſition; encounter.—4. Diſgrace; ſhame.

To AFFRONT, *v. a.* 1. To meet face to face; to encounter.—2. To meet in an hoſtile manner, front to front. 3. To offer an open inſult; to offend avowedly.

AFFRONTER, *n. s.* the perſon who affronts.

AFFRONTING, *part. adj.* that which has the quality of affronting; contumelious.

AFFRONTIVE, *adj.* abuſive; injurious.

AFFUERA, one of the iſlands of Juan Fernander, ſituated about three degrees to the weſtward of the kingdom of Chili, and about 400 leagues to the northward of Cape Horn. The iſland is ſmall, and contains nothing very remarkable; but the coaſt ſwarms with ſea lions and wolves.

To AFFUSE, *v. a.* to pour one thing upon another.

AFFUSION, *n. s.* the act of pouring one thing upon another.

To AFFY, *v. a.* to betroth in order to marriage.

AFGHANS, a people in Perſia, who, under Kouli Khan, ſubverted the Perſian monarchy.

AFIELD, *adv.* to the field.

AFLAT, *adv.* level with the ground.

AFLOAT, *adv.* floating; borne up in the water; not ſinking.

AFOOT, *adv.* 1. On foot; not on horſeback.—2. In action.—3. In motion.

AFORE, *adv.* 1. In time foregone or paſt.—2. Firſt in the way.—3. In front; in the fore part.

AFORE, *prep.* 1. Not behind.—2. Nearer in place to any thing.—3. Sooner in time.

AFGREGOING, *part. adj.* going before.

AFOREHAND, *adv.* 1. By a previous proviſion.—2. Provided; prepared; previouſly fitted.

AFOREMENTIONED, *adj.* mentioned before.

AFORENAMED, *adj.* named before.

AFORESAID, *adj.* ſaid before.

AFORETIME, *adv.* in time paſt.

AFRAID, *part. adj.* ſtruck with fear; terrified; fearful.

AFRESH, *adv.* anew; again; after intermiſſion.

AFRICA, one of the four great diviſions of the world, is bounded on the N. by the Mediterranean, which ſeparates it from Europe; on the NE. by the Red Sea, which divides it from Aſia, and to which it is attached by a neck of land called the *Iſthmus of Suez*, about 60 miles over, ſeparating the Mediterranean from the Red Sea; and on the W. S. and E. by the main ocean: ſo that it is properly a vaſt peninſula, bearing ſome faint reſemblance to a pyramid, the baſe of which is the northern part, running along the ſhores of the Mediterranean; and the top the moſt ſoutherly point, called the *Cape of Good Hope*. Its greateſt length from N. to S. from Cape Bona in the Mediterranean, in 37 0 N. to the Cape of Good Hope, in 34 7 S. Lat. is 4300 miles; and its greateſt breadth from Cape Verd, in 92 20 to Cape Guardafui, near the Straits of Babermandel, in 126 20 E. Long. is 3500 miles from E. to W.

AFRICA, ADVANTAGEOUS SITUATION OF.—Though the greateſt part of this continent hath been in all ages unknown both to the Europeans and Aſiatics, its ſituation is more favourable than either Europe or Aſia for maintaining an intercourſe with other nations, becauſe it ſtands, as it were, in the centre of the other three quarters of the globe; and has thereby a much nearer communication with Europe, Aſia, and America, than any one of theſe has with another.

AFRICA, ANCIENT STATE OF. In ancient times, this diviſion of the globe contained ſeveral kingdoms and ſtates eminent for arts, ſciences, and riches. The kingdoms of Egypt and Ethiopia were particularly celebrated; the former having been conſidered as the birth-place of the arts and ſciences: and the rich and powerful republic of Carthage, that once formidable rival even to Rome itſelf, extended her commerce to every part of the then known world. Only a ſmall part, however, of this extenſive continent was known to the ancient Greeks and Romans; viz. the kingdom of Egypt, and the northern coaſt, comprehending little more than what is now known by the name of *Barbary*. It was divided into *Africa Propria*, and *Africa Interior*. Africa Propria only comprehended the Carthaginian territories. Africa Interior comprehended all other nations to the ſouthward of theſe territories, or thoſe at a greater diſtance from Rome. The only kingdoms, however, with which the Romans had any connection, were the Numidians, the Mauritanians, and the Gætuli. All theſe, as well as Egypt, were ſwallowed up by that enormous power, and reduced to the condition of Roman provinces. But the Romans never ſeem to have penetrated beyond the tropic of cancer, between which and the equinoctial line, a multitude of ſavage nations were ſaid to have their reſidence; but that Africa was a peninſula, ſeem to have been totally unknown both to the Europeans and Aſiatics for many ages. It is probable indeed, that ſome of the Phenicians, and their offspring the Carthaginians, were not ſo ignorant; as they carried navigation to a much greater height than either the Greeks or Romans: but their diſcoveries were all concealed with the greateſt care, leſt other nations ſhould reap the benefit of them; and accordingly we can now find no authentic accounts concerning them. The navigation round Africa, indeed, is recorded by Greek and Roman writers, rather as a ſtrange amuſing tale, than as a real tranſaction; but that it was in reality ſailed round by the Phenecians, we have an indiſputable authority; for ſome of that nation undertook the voyage, at the command of Necho king of Egypt, about 604 years before the Chriſtian æra. They ſailed from a port in the Red-ſea, and after 3 years returned by the Mediterranean: and the very objections, that were made to the veracity of their acc at that time, are unanſwerable proofs to us, that this voy was really accompliſhed. They told, that, having ſailed for ſome time, the ſun became more and more vertical, after which he appeared in the north, and ſeemed to recede from them: that as they returned, the ſun gradually ſeemed to move ſouthwards; and, after becoming vertical once more, appeared then in the ſouth ſide of them as before they ſet out. This, which we know muſt certainly have been the caſe, was deemed incredible at that time, and univerſal ignorance concerning the extent of this continent prevailed till the 15th century. The Romans for a long time maintained their power in Africa; but in the year 426, Bonifacius, ſupreme governor of all the Roman dominions in this quarter, having revolted, called in to his aſſiſtance the Vandals, to whom, in conſequence of a peace concluded in 435, Numidia and ſome other countries were ceded; and they ſoon after ſeized all the reſt. Theſe barbarians, however, did not long enjoy their new poſſeſſions; for, about the year 533, Beliſarius drove them out, annexing the provinces to the eaſtern empire; and in 647, the Saracens having conquered Meſopotamia, Egypt, Phenicia, Arabia, and Paleſtine, broke like a torrent into Africa, which they quickly ſubdued. Their vaſt empire being in 936 divided into ſeven kingdoms, the African ſtates retained their independency long after the others were ſubdued by the Turks: but in the beginning of the 16th century being afraid of falling under the yoke of Spain, they invited the Turks to their aſſiſtance; who firſt protected, and then enſlaved them.

AFRICA, CLIMATE OF, RIVERS, &c. As the equator divides this continent almoſt in the middle, the far greater part of it is within the tropics; and of conſequence the heat in ſome places is almoſt inſupportable by Europeans, it being there greatly increaſed by vaſt deſerts of burning ſand. The inhabitants are totally unacquainted with ice, hail, or ſnow; and in theſe ſcorching regions, the natives would as ſoon believe that marble would melt and flow in liquid ſtreams, as that water ſhould be arreſted by cold, and become like a ſolid rock. It cannot be doubted, however, that, were the country well cultivated, it would be extremely fertile; and would produce in great abundance, not only the neceſſaries, but alſo the luxuries of life.—Whatever may be the caſe with the internal parts of Africa, it is certain that its coaſts are well watered with many conſiderable rivers. The Nile and the Niger may be reckoned among the largeſt in any part of the world, America excepted. The firſt diſcharges itſelf into the Mediterranean, after a prodigious courſe from its ſource to Abyſſinia; the latter is ſuppoſed to run through a tract of land little leſs than 3000 miles. Both theſe rivers annually overflow their banks, fertilizing the countries through which they paſs. The Gambia and Senegal rivers are only branches of the Niger. Many vaſt ridges of mountains alſo run thro' different parts of this continent; but their extent is very little known. Some of the moſt remarkable are, 1. Thoſe called *Atlas*, lying between the 20th and 25th degree of north latitude, and ſuppoſed almoſt to divide the continent from eaſt to weſt. 2. The *mountains of the moon*, ſo called on account of their great height; ſuppoſed to be the boundaries between Abyſſinia and ſome of the interior kingdoms. 3. The mountains of *Sierra Leona*, ſo called on account of their abounding with lions, and likewiſe ſuppoſed to be the boundaries of ſome of the nations. 4. Thoſe called by the ancients the *mountains of God* on account of their being ſubject to perpetual thunder and lightning. 5. The Peak of Teneriffe is about two miles high, and ſituated on an iſland near the coaſt. Of all theſe, however, the laſt excepted, little more is known than their names.

AFRICA, MODERN DISCOVERIES OF. The firſt attempts towards attaining a knowledge of Africa was made by the Portugueſe in 1412. Notwithſtanding their vicinity, they had never ventured beyond Cape *Non*, ſituated in about N. lat. 27°: it had received its name from a ſuppoſed impoſſibility of paſſing it. This year they proceeded 160 miles farther, to Cape Bojador; which ſtretching a conſiderable way into the Atlantic ocean, with rocky clifts, appeared ſo dreadful to the navigators, that they returned without any attempt to paſs it. In an attempt to double this formidable cape, they diſcovered the Madeira Iſlands 1419: but Cape Bojador continued to be the boundary of their continental diſcoveries till 1433; when they penetrated within the tropics, and in a few years diſcovered the river Senegal, Cape de Verd, and the iſlands which lie off that promontory. In 1449, the weſtern iſlands, called the *Azores*, were diſcovered; and in 1471, they firſt penetrated beyond the line; and were ſurpriſed to find, that the torrid zone, contrary to the opinion of the ancients, who imagined it to be burnt up with heat, was not only habitable, but fertile and populous. In 1484, they proceeded 1500 miles beyond the line; and two years afterwards, the Cape of Good Hope was diſcovered by Bartholomew de Diaz; but it was not till the year 1497, that the Portugueſe, under Vaſquez de Gama, actually doubled this cape, and diſcovered the true ſhape of the continent. Thus the coaſts of Africa were made perfectly known; and probably the knowledge concerning its interior parts would have been much greater than it is, had not the general attention been called off from this continent by the diſcovery of America in 1492.

AFRICA, PRESENT STATE OF. The Barbary ſtates ſtill continue in a kind of dependence on the Ottoman empire. They are not, however, properly ſpeaking, the *ſubjects* of the Grand Signior, but call him their *protector*, paying him an annual tribute. On the coaſts, the natives are almoſt all addicted to piracy; and with ſuch ſucceſs have they carried on their employment, that though their naval force be quite inſignificant, the moſt powerful commercial nations in Europe, have, from a moſt incomprehenſible policy, for a long ſeries of years, paid them tribute for liberty to navigate the Mediterranean. Soon after the eſtabliſhment of American Independence, they began their depredations on our defenceleſs commerce, and many of our citizens were carried to Algiers, where after a captivity of ſeveral years, they were ranſomed by the United States, at an immenſe ſum. Peace was then purchaſed of all the piratical ſtates; but the Dey of Tripoli has, of late, thought proper to make freſh demands, with which our government has very wiſely determined not to comply. A ſmall ſquadron has, therefore, been ſent to the Mediterranean to protect our trade againſt the attacks of this unprincipled robber, and at the firſt commencement of hoſtilities, our ſucceſs has been equal to the juſtice of our cauſe; Lieutenant Sterret, of the United States ſchooner Enterprize, having taken and diſmantled one of their veſſels of ſuperior force, and the remainder of their cruiſers being obliged to confine themſelves in port. See ALGIERS, TRIPOLI.—The interior nations are ſcarce known by name; nor do almoſt any two of the moſt learned moderns agree in their diviſion of Africa into kingdoms; and the reaſon is, that ſcarcely any traveller hath ever penetrated into thoſe inhoſpitable regions. According to the beſt accounts, concerning thoſe regions of Africa lying beyond Egypt and Barbary, they are divided in the following manner. On the weſtern coaſt, to the ſouth of Barbary, lie the kingdoms of Biledulgerid, Zaara, Negroland, Loango, Congo, Angola, Benguela, and Terra de Natal. On the eaſtern coaſt beyond Egypt, are thoſe of Nubia, Adel, Ajan, Zanguebar, (between theſe two a huge deſart is interpoſed) Monomotapa, and Soſala. In the interior parts the kingdoms of Lower Ethiopia, Abex, Monomugi, and Mataman, are made mention of. The ſouthermoſt part, called Caffraria, is well known for the habitation of the Hottentots. In many material circumſtances, the inhabitants of this continent agree with each other. If we except the people of Abyſſinia, who are tawny, and profeſs a mixture of Chriſtianity, Judaiſm, and Paganiſm, they are all of a black complexion. In their religion, except on the ſea coaſts, which have been viſited and ſettled by ſtrangers, they are Pagans; and the form of government is every where monarchical, or rather deſpotic.

Africa, productions of. No part of the world abounds with gold and ſilver more plentifully than Africa; and it is ſurpriſing, that neither the ancient nor modern Europeans, notwithſtanding their extravagant and inſatiable thirſt after theſe metals, ſhould have endeavored to eſtabliſh themſelves effectually, in a country much nearer to them than either America or the Eaſt Indies; and where the objects of their deſire are found in equal, if not greater, plenty. Copper is alſo found on this continent in great plenty, inſomuch that the mountains of Atlas above mentioned are ſaid to be all compoſed of copper ore. As to animals, there is hardly any ſpecies, wild or tame, that is not to be found in Africa. Lions, tygers, elephants, crocodiles, leopards, hyænas, ichneumons, hippopotamuſes, &c. are numberleſs; beſides a great variety of birds, ſerpents, and other animals quite unknown in Europe. The fertility of a country ſo prodigiouſly extenſive, might be ſuppoſed more various than we find it is: in fact, there is no medium in the regions of Africa with regard to the advantages of ſoil; they are either perfectly barren, or extremely fertile. This ariſes from the intenſe heat of the ſun; which, where it meets with ſufficient moiſture, produces the utmoſt luxuriancy; and in thoſe countries where there are few rivers, reduces the ſurface of the earth to a barren ſand. The countries of Mandingo, Ethiopia, Angola, Batna, Truticbi, Monomotapa, Caſati, and Mehenemugi are extremely rich in gold and ſilver. The baſer metals, likewiſe, are found in theſe and many other parts of Africa. But the perſons of the natives make the moſt conſiderable article in the produce and traffic of this miſerable quarter of the globe. In ſhort, Africa, though a full quarter of the globe, ſtored with an inexhauſtible treaſure, and capable of procuring almoſt every neceſſary, convenience, and luxury of life, within itſelf, ſeems to be utterly neglected both by its own inhabitants, and all other nations: the former, being in a ſavage ſtate, are incapable of enjoying the bleſſings offered them by nature; and the latter taking no farther notice of the inhabitants, or their land, than to obtain at the eaſieſt rate what they procure with as little trouble as poſſible, or to carry them off for ſlaves to the plantations in America,

Africa, trade of. On the Guinea or weſtern coaſt, the Engliſh trade to James's Fort, and other ſettlements near, and up the river Gambia; where they exchange their woollen and linen manufactures, their hardwares and ſpirituous liquors, for the perſons of the natives. By the treaty of peace in 1783, the river Senegal, with its dependencies, were given up to France. Gold and ivory, next to the ſlave trade, form the principal branches of African commerce. Theſe are carried on from the ſame coaſt, where the Dutch and French, as well as the Engliſh, have their ſettlements. But the French, much to their honour, ſoon after the commencement of their revolution, ſet a glorious example of humanity, to all the powers of Europe, by the total abolition of the ſlave trade. The Portugueſe are in poſſeſſion of the eaſt and weſt coaſt of Africa, from the Tropic of Capricorn to the Equator; which immenſe tract they became maſters of by their diſcovery of the Cape of Good Hope. From the coaſt of Zanguebar, on the eaſtern ſide, they trade not only for the articles above mentioned, but likewiſe for ſeveral others; as ſena, aloes, civet, ambergris, and frankincenſe. The Dutch have ſettlements towards the ſouthern part of the continent, in the country called Caffraria, or the land of the Hottentots, particularly *Cape-Town*, which is well ſettled and fortified; *where their ſhips* bound for India uſually put in, and trade with the natives for their cattle, in exchange for which they give them ſpirituous liquors. The Portugueſe being ſovereigns of the greateſt part of the coaſt, have a number of the African princes their tributaries. There are ſome independent princes who have extenſive dominions; particularly the kings of Dahome and Widah, the moſt noted of any for the infamous ſlave trade. For upwards of 200 years have the European nations traded with Africa in human fleſh; and encouraged in the Negro countries, wars, rapines, deſolation, and murder, that the Weſt India iſlands might be ſupplied with ſlaves! The annual exportation of men, women, and children, from Africa, for ſlaves, hath exceeded 100,000! numbers of whom are driven down like ſheep, perhaps 1000 miles from the ſea-coaſt, generally inhabitants of villages that have been ſurrounded in the night by armed force, and carried off to be ſold to the traders. Various attempts have of late been made in the Britiſh legiſlature, to put a ſtop, or at leaſt, to modify this iniquitous traffic, but the efforts of the friends of humanity have been hitherto ineffectual in that kingdom. Of this, however, as well as of the abolition of ſlavery in the French colonies, and of its exiſtence in the United States, we ſhall treat largely hereafter. See Slave Trade.

AFRICUS, the wind S. W. and by W. ſo called from its blowing from Africa.

AFRONT, *adv.* in front; in direct oppoſition to the face.

AFT, in the ſea language, the ſame with Abaft, which ſee.

AFTER, *adv.* 1. In ſucceeding time.—2. Following another.

After, *prep.* 1. Following in place.—2. In purſuit of.—3. Behind.—4. Poſterior in time.—5. According to.

After is compound with many words, but almoſt always in its genuine and primitive ſignification.

AFTERAGES, *n. s.* ſucceſſive times; poſterity.

AFTER ALL, at laſt; in fine; in concluſion; upon the whole.

AFTERBIRTH, *n. s.* the coat or membrane in which the fœtus or birth was involved in the womb. It is thus called, becauſe it comes away ſome time after the fœtus, by way of a ſecond birth or delivery. Phyſicians uſually call it the *ſecundine*. It alſo includes the *placenta uterina*, popularly called the womb-cake. In brutes, it is denominated the *beam*, or cleaning. The afterbirths of ripe children are brought away more eaſily than thoſe of abortions. See **Midwifery**.

AFTERCLAP, *n. s.* an unexpected event happening after an affair is ſuppoſed to be at an end.

AFTERCOST, *n. s.* the latter charges; the expence incurred after the original plan is executed.

AFTERCROP, *n. s.* the ſecond crop or harveſt of the ſame year.

AFTERGAME, *n. s.* the ſcheme which may be laid, or the expedients which are practiſed after the original deſign has miſcarried; methods taken after the firſt turn of affairs.

AFTERMATH, *n. s.* the latter math; the ſecond crop of graſs mown in autumn.

AFTERNOON, *n. s.* the time from the meridian to the evening.

AFTERPAINS, *n. s.* the pains after birth, by which women are delivered of the ſecundine. They are felt in the loins, the groin, &c. and ſeem to ariſe from a diſtention of the ligaments of the uterus in time of delivery, and are ſeldom dangerous, unleſs aggravated by a detention of the lochia. To prevent them, oil of ſweet almonds, ſpermaceti, ſyrup of *cappillus Veneris*, &c. are uſually preſcribed. See **Midwifery**.

AFTERPART, *n. s.* the latter part.

AFTERPROOF, *n. s.* 1. Evidence poſterior to the thing in queſtion.—2. Qualities known by ſubſequent experience,

AFTERTASTE, *n. s.* a taſte remaining upon the tongue after the draught, which was not perceived in the act of drinking.

AFTERTHOUGHT, *n. s.* reflections after the act; expedients formed too late.

AFTER-TIMES, *n. s.* ſucceeding times. See **After-ages**.

AFTERTOSSING, *n. s.* the motion of the ſea after a ſtorm.

AFTERWARD, *adv.* in ſucceeding time.

AFTERWIT, *n. s.* the contrivance of expedients after the occaſion of uſing them is paſt.

AFTER-WRATH, *n. s.* anger when the provocation ſeems paſt.

AFUERA. See **Affuera**.

AGA, *n. s.* the title of a Turkiſh military officer.

Aga, in the Turkiſh language, ſignifies a great lord or commander. Hence the general of horſe is denominated *ſpahiclar aga*, and the aga of the Janiſſaries is the commander in chief of that corps. He is an officer of great importance, and is the only perſon who is allowed to appear before the Grand Signior, without his arms acroſs his breaſt, in the poſture of a ſlave. We find alſo agas in other countries. The chief officers under the Khan of Tartary are called by this name. And among the Algerines, we read of agas choſen from among the boluk baſhis (the firſt rank of military officers,) and ſent to govern in the chief towns and garriſons of that ſtate. The aga of Algiers is the Preſident of the divan, or ſenate. For ſome years, the aga was the ſupreme officer, and governed the ſtate in place of baſhaw, whoſe power dwindled to a ſhadow. But the ſoldiers riſing againſt the boluk baſhis, or agas, maſſacred moſt of them, and transferred the ſovereign power to the calif, with the title of *dey* or king.

AGAI. See **Agio**.

AGAIN, *adv.* 1. A ſecond time; once more.—2. On the other hand.—3. On another part.—4. Back.—5. In return for any thing; in recompence.—6. Twice as much; marking the ſame quantity once repeated.—7. *again and again;* with frequent repetition; often.

AGAINST, *prep.* 1. In oppoſition to any perſon.—2. Contrary; oppoſite in general.—3. In oppoſition to any opinion.—4. With contrary motion or tendency.—5. Contrary to.—6. Oppoſite to, in place.—7. In proviſion for; in expectation of.

AGAMENTICUS, in the dirict of Maine, is a mountain of conſiderable height, diſtant about 8 miles from York harbour, and lying in 43. 16. N. Lat. 4. 20. E. Lon. It is a noted land-mark for ſeamen, and ſerves as a good direction for the entry of Piſcataqua harbour, as it lies very nearly in the ſame meridian with it, and with Pigeon Hills, on Cape Ann. The mountain affords paſturage up to its ſummit, from which there is a grand and delightful proſpect. The cultivated parts of the country, eſpecially on the S. and S. W. appear as a moſt beautiful garden, whilſt the immenſe ranges of mountains, to the N. and N. W. afford a ſpectacle truly ſublime. In a clear day, all the turnings and windings of the coaſt, may be diſtinguiſhed to an extent almoſt incredible; whilſt the wide Atlantic may be viewed to a prodigious diſtance towards the Eaſtward.

AGAN, one of the Ladrone iſlands, where Magellan, in ſearch of the Moluccas, was aſſaſſinated.

AGANIPPIDES, in ancient poetry, a deſignation given to the Muſes.

AGAPE, *adv.* ſtaring with eagerneſs.

Agape, (a word in the Greek language ſignifying love,) the love feaſt, or feaſt of charity, in uſe among the primitive Chriſtians; when a liberal contribution was made by the rich to feed the poor. St. Chryſoſtom gives the following account of this feaſt, which he derives from the apoſtolical practice. He ſays, “The firſt Chriſtians had all things in common, as we read in the Acts of the Apoſtles; but when that equality of poſſeſſions ceaſed, as it did even in the Apoſtles time, the agape, or love feaſt, was ſubſtituted in the room of it. Upon certain days, after partaking of the Lord's ſupper, they met at a common feaſt; the rich bringing proviſions, and the poor who had nothing, being invited.”

AGARIC, in botany. See **Agaricus**.

Agaric, in pharmacy, a kind of fungous excreſcence, growing on the trunks and large branches of ſeveral trees; but chiefly, on the larch tree, and upon ſome kinds of oak, when decayed. Three fourths of it conſiſt of a reſinous ſubſtance, and the remainder is a ſlimy mucilaginous earthy matter, ſo tenacious, as ſcarcely, by any method, to be diſſolved by water. It is eaſily cut with a knife, friable betwixt the fingers, and has no hard, gritty, or coloured veins. It is an ingredient in the *theriaca Andromachi*, where it is admitted in quality of a cordial: though its cardiac virtue is excepted to as much as its purgative. It was a purge in much eſteem among the ancients, but has deſervedly fallen into diſrepute of later years, as it occaſions inſupportable nauſea. Tournefort enumerates eighteen ſpecies of agaric. But it is more generally divided into three kinds; the male, the female, and the falſe or ſpurious agaric. It is found in different countries, but the beſt kind is ſaid to come from the Levant.

AGARICUS, or MUSHROOM, a genus of the order of fungi, belonging to the cryptogamia claſs of plants. Botanical writers enumerate 55 ſpecies belonging to this genus; of which the moſt remarkable are the following.

1. The CAMPESTRIS, or common muſhroom, has the top or cap firſt of a dirty cream colour, convex, and if but juſt expanding, the under part, or what is called the gills, is of a bright fleſh red: this colour laſts but a little time, before it turns darker; and when the plant is old, or has been ſometime expanded, the gills become of a dark brown, the cap almoſt flat, of a dirty colour, and often a little ſcaly. It differs much in ſize in different plants, being from an inch to 7 inches broad. The general uſe of it is well known. It is found in woods, old paſtures, and by road ſides; and is in the greateſt perfection in September. There is a variety of this with a yellowiſh white cap, and white gills; this is very firm, but ſeldom expands ſo freely as the true ſort, and when broiled will exude a yellowiſh juice. It is probable this ſort is not pernicious, though it is always rejected by ſuch as can diſtinguiſh it.

2. The PRATENSIS, or CHAMPIGNION, is very common upon heaths and dry paſtures. A number of them generally come up in a place, ranged in curved lines or circles. The cap is ſmall, almoſt flat, from one to two or three inches diameter, of a pale buff colour, often crimpled at the edges, and when dry, tough like leather, or a thin piece of fine cork. The gills are of the colour of the cap, are thinly placed, with a ſhort one, and ſometimes two, coming from the edge of the cap between each. The ſtalk, or pillar, is alſo of the ſame colour, as the cap: it is long, ſlender, and all the way of a thickneſs. This plant has but little ſmell, and is rather dry. When broiled or ſtewed, it communicates a good flavor. It is in perfection at the ſame time with the former.

3. The CHANTARELLUS, or CHANTARELLE AGARIC, is rather a ſmaller fungus than the former. The cap is yellow, of different hues in different plants, ſome being of a pale yellow, and others of an orange colour. It is generally ſunk in the middle, ſomewhat reſembling a tunnel; and its edges are often twiſted and contorted, ſo as to form ſinuſes, or angles. The gills are of a deeper colour than the outſide, are very fine, even, numerous, and beautifully branched. The ramifications begin at the ſtalk, and are variouſly extended towards the edge of the cap. The pillar is of the ſame colour as the cap, and ſeldom inſerted in the centre, but rather ſideways: it is ſhort, thickiſh at the root, and the gills moſtly run down the top, which make it appear the ſmalleſt in the middle. This plant broiled, with ſalt and pepper, has much the flavor of a roaſted cockle; and is eſteemed a delicacy by the French, as is the former. It is found in woods and high paſtures, and is in perfection about the end of September.

4. The DELICIOSUS, or orange agaric. The general ſize of the cap of this ſpecies is from 2 to 4 inches broad. Its form is circular, with the edges bent inwards; convex on the upper ſurface, except in the centre, where it is a little depreſſed, ſo as nearly to reſemble the apex of a ſmooth apple. The colour is a ſordid yellow, ſtreaked with aſh and yellowiſh brown, from the centre to the edge; and when it is broken, it emits a gold colour juice. The gills are of a deep yellow, and a few of them come out by pairs at the ſtalk, but divide immediately, and run ſtraight to the edge of the cap. The ſtalk, or pillar, is thinneſt near the middle, thickeſt at the root, and when cut tranſverſely, it is quite white in the centre, with a fine yellow ring that goes to the edge. This fungus, well ſeaſoned, and then broiled, has the exact flavor of a roaſted muſcle. Its prime time is September, and it is to be found in high dry woods.

5. The CINNAMOMEUS, or brown muſhroom, has a cap the colour of freſh tanned hides. At firſt it is hemiſpherical, firm, even, and fleſhy, with moſtly a ſmall riſing in the centre; but when old it is quite flat. The gills are of a yellowiſh brown, not very diſtant from each other, bent like a knee at the pillar, and have a ſhort one or two run from the edge of the cap between each. The pillar is near the length of a finger, firm, rather thick, brown at the baſe, of a ſordid yellow upward, and when cut tranſverſely, of a fine white grain. The cap in different plants is from 2 to 5 inches broad. The whole plant has a pleaſant ſmell, and when broiled, gives a good flavor. It is found in woods in September and October.

6. The VIOLACEUS, or violet muſhroom. Its cap, when firſt expanded, is ſmooth, hemiſpherical, the main ſurface of a livid colour, but towards the margin it is of a better blue. When full grown or old, it becomes corrugated, and of a ruſty brown. The gills of a young plant are of a beautiful violet colour, and regularly placed. The pillar is of the colour of the gills, ſhort, of a conical form, but ſwelled at the baſe into a ſort of bulb. Its upper part is ſurrounded with an iron-coloured wool, which, in a plant juſt expanding, ſtretches acroſs to the edge of a cap like a web. This ſpecies requires much broiling; but when ſufficiently done, and ſeaſoned, it is as delicious as an oyſter. It is found in woods in October. Hudſon's *bulboſus* is only a variety of this plant.

The above are the only ſpecies that can be ſafely recommended as elidible; though there are ſome other ſorts which are frequently eaten by the country people; and it is probable the greateſt part of thoſe with firm fleſhy caps, might be eaten with ſafety, provided they were choſen from dry grounds. It is well known that ſoil and ſituation have a great influence upon the properties of plants; and theſe being of a ſimilar nature, and abſolutely between that of an animal and vegetable, may be more powerfully affected than a complete ſpecies of either, by reaſon they have neither leaves nor branches to carry off the noxious damps and vapours of a ſtagnant ſoil, as a perfect vegetable has; nor have they any groſs excremental diſcharges, like thoſe of a living animal. The gills, no doubt, do exhale ſome of their ſuperfluous moiſture; but their ſituation is ſuch, that any thick ſteam from the earth may lodge in them, and, by clogging their excretory ducts, render the plants morbid. Thus they ſoon run into a ſtate of putrefaction, and become a prey to worms, flies, and other inſects. The common muſhroom, which is in general eſteem (though we have ſeveral others better) is not ſafely eaten when produced upon a moiſt ſoil. Thoſe who gather muſhrooms for ſale, ſhould therefore have particular regard to the lands they collect them from, eſpecially if they know they are to be broiled; but if they are intended for catchup, perhaps they may be leſs cautious, as the ſalt and ſpices with which the juice is boiled may correct any evil diſpoſition in the plants. But, even in this caſe, catchup made of muſhrooms taken from a dry ſoil, has a more aromatic and pleaſant flavour than that which is made of thoſe taken from a moiſt one, and it will always keep a great deal better.

Of the poiſonous ſorts, the two following are the moſt ſingular:

7. The **Mustarius**, or reddiſh muſhroom, has a large hat, almoſt flat, either white, red, or crimſon, ſometimes beſet with angular red warts; the gills are white, flat, and inverſely ſpear-ſhaped; the pillar is hollow; the cap fixed to the middle of the pillar, limber, and hanging down. This ſpecies grows in paſtures, and is ſaid to deſtroy bugs effectually, if the juice is rubbed upon the walls and bedpoſts. The inhabitants of the north of Europe, whoſe houſes are greatly infeſted with flies at the decline of ſummer, infuſe it in milk, and ſet it in their windows; and the flies, upon taſting the leaſt drop, are inſtantly poiſoned. An infuſion of common pepper in milk anſwers the ſame purpoſe: but the flies, through time, become wiſe enough not to taſte it; and though vaſt numbers are at firſt deſtroyed, it is impoſſible to clear a houſe of theſe inſects by this means. This is the *moucho-more* of the Ruſſians, Kamtſchadales, and Koriacs, who uſe it as an inſtrument of intoxication. They ſometimes eat it dry; ſometimes immerſed in a fermented liquor, made with the epilobium, which they drink, notwithſtanding the dreadful effects. They are firſt ſeized with convulſions in all their limbs, then with a raving, ſuch as attends a burning fever. A thouſand phantoms, gay or gloomy (according to their conſtitutions) preſent themſelves to their imaginations: ſome dance; others are ſeized with unſpeakable horrors. They perſonify this muſhroom; and if its effects urge them to ſuicide, or any dreadful crime, they ſay they obey its commands. To fit themſelves for premeditated aſſaſſinations, they take the moucho-more. Such is the faſcination of drunkenneſs among theſe people, that nothing can induce them to forbear this dreadful potion!

8. The **Clypeatus**, or long-ſtalked muſhroom, has an hemiſpherical hat, tapering to a point, and clammy; the pillar is long, cylindrical, and white; the gills are white, and not concave, duſted with a fine powdery ſubſtance on each ſide: the root is bulbous, long, and hooked at the end. It is found in September, in woodlands and paſtures. This ſpecies is thought to be poiſonous; and we have the following account of the ſymptoms produced by eating it, in Dr. Percival's Eſſays. "Robert Uſherwood, of Middleton, near Mancheſter, a ſtrong healthy man, aged 50 years, early in the morning gathered and eat what he ſuppoſed to be a muſhroom. He felt no ſymptoms of indiſpoſition till five o'clock in the evening; when, being very thirſty, he drank near a quart of table beer. Soon afterwards he became univerſally ſwoln, was ſick, and in great agonies. A ſevere vomiting and purging ſucceeded, with violent cramps in his legs and thighs. He diſcharged ſeveral pieces of the fungus, but with little or no relief. His pains and evacuations continued, almoſt without intermiſſion, till the next night; when he fell into a ſound ſleep, and awaked in the morning perfectly eaſy, and free from complaint." Many of the different ſpecies of this genus grow on cows or horſes dung, on dunghills, on rotten wood, in cellars, or on the trunks of trees. In ſome countries of Europe, the eſculent muſhrooms are ſo highly eſteemed, that they are cultivated in gardens; but as they are found in great abundance in moſt parts of the United States, it becomes altogether unneceſſary to lay before our readers, a particular mode of rearing them.

Phyſicians have diſputed much about the qualities of muſhrooms; ſome conſidering them as a rich nouriſhment, and perfectly innocent, when properly choſen; and others aſſerting them to be extremely deleterious. Moſt of the fungi are, indeed, of a hurtful quality; and, with reſpect to the whole tribe, the eſculent are very few. Eſculent muſhrooms are very nutritive, very readily alkaleſcent, and more ſo without intermediate aceſcency than any other vegetable; they are therefore, a rich nouriſhment, and much a-kin to animal food; on which account they may be indulged in conſiderable quantity to ſtrong perſons. It requires, however, ſkill to diſtinguiſh this eſculent kind; and very few, eſpecially of thoſe who are commonly employed to gather them, have ſtudied Cluſius, or other authors, who have been at the pains to diſtinguiſh them. Perhaps eſculent muſhrooms, if old, acquire a dangerous acrimony; and for theſe reaſons, Dr. Cullen is of opinion, that it is for the moſt part prudent to avoid them.

AGAST, *adj.* [uſually, by later authors, written *aghast.*] Struck with terror; amazed; frighted to aſtoniſhment.

AGATE, an inſtrument uſed by gold-wire drawers; ſo called from the agate in the middle of it, which forms its principal part. See the following articles.

Agate, *n. s.* a precious ſtone of the loweſt claſs, often clouded with beautiful variegations.

Agate, or **Achat**, (ſo called, from a river in Sicily, on the banks of which it was firſt found) a very extenſive genus of the ſemipellucid gems. Theſe ſtones are variegated with veins and clouds, but have no zones like thoſe of the onyx. They are compoſed of chryſtal debaſed by a large quantity of earth, and not formed, either by repeated incruſtations round a central nucleus, or made up of plates laid evenly on one another; but are merely the effect of one ſimple concretion, and variegated only by the diſpoſition given, by the fluid they were formed in, to their differntly coloured veins or matters.

AGATHOPOLIS, the city of Montpelier in France. See Montpelier.

AGATY, *adj.* partaking of the nature of agate.

AGAVE, the common American aloe: A genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 10th order, Coronariæ. The characters are: There is no calyx: The corolla is monopetalous and funnel-ſhaped; the border ſix-parted, with lanced erect diviſions: The ſtamina conſiſt of ſix erect filaments, longer than the corolla; the antheræ are linear, ſhorter than the filaments and verſatile: The piſtillum is an oblong germen; the ſtylus is filiform, the length of the ſtamina, and triangular; the ſtigma headed and triangular: The pericarpium is an oblong triangular capſule, trilocular, and three-valved: The ſeeds are numerous. Of this genus, botanical writers enumerate eight ſpecies. The ſtems of the *Americana*, or great American aloe, generally riſe upwards of 20 feet high, and branch out on every ſide towards the top, ſo as to form a kind of pyramid: the ſlender ſhoots being garniſhed with greeniſh yellow flowers, which ſtand erect, and come out in thick cluſters at every joint: theſe make a fine appearance, and continue long in beauty; a ſucceſſion of new flowers being produced for near three months in favourable ſeaſons, if the plant is protected from the autumnal colds. The ſeeds do not ripen in England. It has been generally thought, that theſe plants do not flower till they are 100 years old: but this is a miſtake; for the time of their flowering depends on their growth: ſo that in hot countries, where they grow faſt, and expand many leaves every ſeaſon, they will flower in a few years; but in colder climates, where their growth is ſlow, it will be much longer before they ſhoot up their ſtem. Their is a variety of this ſpecies with ſtriped leaves, which are pretty common in the Engliſh gardens. The other ſorts are ſo tender, that they muſt conſtantly remain in the ſtove.

To AGAZE, *v. a.* to ſtrike with amazement; to ſtupify with ſudden terror.

AGAZED, *part. adj.* ſtruck with amazement; terrified to ſtupidity.

AGDE, a populous city of France, in Lower Languedoc, in the department of Herault. Seven leagues from Narbonne, and ten from Montpelier. It produces fine wool, wine, oil, corn, and ſilk. It is ſeated on the river Eraut, a mile and a quarter from its mouth, where it falls into the gulph of Lyons, on which there is a fort built to guard its entrance. The houſes are built of black ſtone, and there is an entrance into the city by four gates, which is extended along the river, where it forms a ſmall port, wherein ſmall craft may enter. There was formerly a great concourſe of pilgrims to the chapel of Notre Dame de Grace. It is a little without the city, between which and the capital, there are about 13 or 14 oratories, which they uſed to viſit with bare feet. Long. 75. 33. E. Lat. 43. 19. N.

AGE, *n. s.* 1. Any period of time attributed to ſomething as the whole, or part, of its duration: in this ſenſe, we ſay, the *age* of man, the ſeveral *ages* of the world, the golden or iron *age*.—2. A ſucceſſion or generation of men.—3. The time in which any particular man, or race of men, lived, or ſhall live; as, the *age* of heroes.—4. The ſpace of a hundred years; a ſecular period; a century.—5. The later part of life; old age.—6. Maturity; ripeneſs; years of diſcretion; full ſtrength of life.—7. Age, likewiſe, ſignifies a certain period of the duration of human life, by ſome divided into four ſtages, viz. infancy, youth, manhood and old age; the firſt extending to the 14th year, the ſecond to the 25th, the third to the 50th, and the fourth to the end of life. In the American States, a lad at the age of 14 may choſe his guardian, and when he has attained his 21ſt year, he is of full age.

AGE, among the ancient poets, was uſed for the ſpace of 30 years; in which ſenſe, *age* amounts to much the ſame with *generation*. Thus, Neſtor is ſaid to have lived *three ages* when he was 90 years old. The interval ſince the firſt formation of man has been divided by the poets into four *ages*, diſtinguiſhed by the epithets of *golden*, *silver*, *brazen* and *iron*. During the *golden* age, Saturn reigned in heaven, and juſtice and innocence in this lower world. The earth then yielded her productions without culture; men held all things in common, and lived in perfect friendſhip. This period was ſuppoſed to have laſted till the expulſion of Saturn from his kingdom. The *silver* age commenced when men began to deviate from the paths of virtue; and their lives became leſs happy. The *brazen* age commenced on a further deviation, and the *iron* age took place in conſequence of one ſtill greater. The Eaſt Indian Brahmins ſeem to have adopted the idea of the Grecian poets, if the latter did not borrow it from them; or rather, if both were not indebted for it, to the Moſaic account of the original paradiſaical ſtate of man. The Brahmins ſeem evidently to have had at leaſt a traditional account of the longevity of the antediluvian patriarchs, from the deſcription they give of the four ages of the world.—The firſt, which they repreſent as a ſort of golden *age*, laſted, according to them, 1,728,000 years: in this period, the god Brahma was born, and the men were all giants; their manners were innocent: they were exempt from diſeaſes, and lived 400 years.—In the ſecond *age*, which laſted 1,296,000, their rajas was born: vice now crept into the world; ere *men's* lives were fallen to 300 years, and their ſize retrenched proportionally.—Under the third *age*, which laſted 8,064.000 years, vice being more increaſed, men only attained to 200 years.—The laſt *age* is that wherein we now live, of which 4,027,213 years are already gone; and the life of man is ſunk to one fourth of its original duration. A late author, however, reflecting on the barbariſm of the firſt ages, will have the order which the poets aſſign to the four ages inverted; the firſt, being a time of rudeneſs and ignorance, would be more properly denominated an *iron* than a *golden* age. When cities and ſtates were founded, the *brazen* age ſucceeded; when they began to improve, the *silver* age commenced; and ſince arts and ſciences, navigation and commerce have been cultivated, the *golden* age has taken place. The ingenious M. Mercier carries this idea ſtill farther in his work entitled, "Memoirs of the year 2500;" and ſuppoſes, that mankind, when that period arrives, will be ſo much improved, that vice and folly of every kind will be totally extirpated from the earth. Although we are not ſanguine enough to expect, that human nature will ever arrive at ſuch a ſtate of perfection, till the final conſummation of all things, yet we cannot help thinking, that mankind are in a ſtate of progreſſive improvement; that the ſtate of ſociety, in general, has been gradually meliorated within theſe three centuries; and that the age we now live in, with all its follies and vices, is ſuperior in point of humanity and the other ſocial virtues, to any former period of the world ſince the Deluge; owing to the rapid increaſe and general diffuſion of knowledge, philoſophy and liberality of ſentiment, conſequent upon the reformation of religion, and the diſcovery of the art of printing.—Among the Jews, the duration of the world is divided into three ages. 1. The *seculum inane* or *void age*, is the ſpace of time from the creation to Moſes. 2. The *present* age, denotes all the ſpace of time from Moſes to the coming of the Meſſiah; and, 3. The *age to come*, denotes the time from the coming of the Meſſiah to the end of the world. Various other diviſions of the duration of the world into *ages* have been made by hiſtorians.—The Sibylline oracles, wrote, according to ſome, by Jews acquainted with the prophecies of the Old Teſtament, divide the duration of the world into ten *ages*; and according to Joſephus, each age contained ſix hundred years.

It appears, by Virgil's fourth eclogue, and other teſtimonies, that the age of Auguſtus was reputed the end of thoſe ten *ages*, conſequently as the period of the world's duration. The ſeveral *ages* of the world may be reduced to three grand epochas, viz. the *age* of the law of nature, called by the Jews the *void age*, from Adam to Moſes: the *age* of the Jewiſh law, from Moſes to Chriſt; and the *age* of grace, from Chriſt to the preſent year.

AGE OF A HORSE. See HORSE.

AGE OF A TREE. Theſe after a certain age waſte. An oak at 100 years old ceaſes to grow. The uſual rule for judging of the *age* of wood, is by the number of circles which appear in the ſubſtance of a trunk or ſtock cut perpendicularly, each circle being ſuppoſed the growth of a year; though ſome reject this method as precarious, alledging, that a ſimple circle is ſometimes the produce of ſeveral years; beſides that, after a certain age, no new circles are formed.

AGED, *adj.* old; ſtricken in years.

AGEDLY, *adv.* after the manner of an aged perſon.

AGEN, a city of France, on the banks of the Garonne, the capital of Agenois, in the department of Lot and Garonne. The gates and walls, which are yet remaining, ſhow that it is very ancient, and that its former circuit was not ſo great as the preſent. The palace, was formerly called the caſtle of Montravel, and is ſeated beyond the walls of the old city, on the ſide of the foſſe, where there are likewiſe the ruins of another caſtle called *La Sagne*. The ſituation of Agen is very convenient for trade. Prunes form a conſiderable article of commerce, with the Dutch, who take great quantities for long voyages. The chief manufactures are linen, camblets, ſerges, and ſail cloths. This city is ſeated in a pleaſant country; but is itſelf rather a diſagreeable place, the houſes being ill-built, and the ſtreets narrow, crooked, and dirty. Lon. 75. 4. E. Lat. 44. 12. N.

AGENCY, *n. s.* 1. The quality of acting; the ſtate of being in action.—2. The office of an agent or factor for another; buſineſs performed by an agent.

AGENDA, among divines and philoſophers, ſignifies the duties which a man lies under an obligation to perform: Thus we meet with the agenda of a chriſtian, or the duties he ought to perform, in oppoſition to the *credenda*, or things he ought to believe.

AGENT, *adj.* that which acts; oppoſed to *patient*, or that which is acted upon.

AGENT, *n. s.* 1. An actor; he that acts; he that poſſeſſes the faculty of action.—2. A ſubſtitute; a deputy; a factor; a perſon employed to tranſact the buſineſs of another. 3. That which has the power of operating or producing effects upon other things.

AGENT, in phyſics, that whereby a thing is done, or effected; or that which has a power whereby it acts upon another; or, by its action, induces ſome change in it. The word agent is uſed promiſcuouſly with *efficient*, and in contradiſtinction to *patient*. The learned divide agents into *natural and free*.

Natural and Phyſical AGENTS are thoſe immediately determined by the Author of nature to produce one ſort of effect, with an incapacity to produce the contrary.

Natural AGENTS, again, are ſubdivided into *univocal*, which are ſuch as produce effects of the ſame kind and denomination with the agents themſelves; and *equivocal* whoſe effects are of a different kind, &c. from the *agents*. The ſchoolmen reckon the following circumſtances neceſſary to the being of an agent, viz. that it be contiguous to the object, diſtinct from it, have a power over it, a ſphere of activity, and a proportion, or rate of acting.

Free or voluntary AGENT is that which may equally do any thing, or its oppoſite; as acting, not from any predetermination, but from choice. Such is the mind ſuppoſed to be, which has a ſpontaneous power of chooſing or refuſing. It is a celebrated queſtion among philoſophers and divines, whether man be a free or neceſſary agent? It may be thus ſtated: Man is a neceſſary agent, if all his actions are ſo determined by the cauſe preceding each action, that no one paſt action could poſſibly not have come to paſs, or have been otherwiſe than it was, nor one future action can poſſibly not come to paſs, or be otherwiſe than it ſhall be. On the contrary, man is a free agent, if he be able at any time, in certain circumſtances, to do different things; or, in other words, if he is not ever unavoidably determined in every point of time, by the circumſtances he is in, to do that one thing he does, and not poſſibly to do any other. Which of theſe two definitions agrees to man, is a queſtion of fact to be determined by what we experience in ourſelves, with regard to the operations in our own minds. See LIBERTY, NECESSITY, and WILL. The term agent evidently implies a power of ſelf-determination; and the epithet *neceſſary*, applied to agent, forms a ſoleciſm both in ſenſe and language. Price's Review, p. 315, &c.

AGENT, in chemiſtry, is ſometimes attributed to menſtrua, or ſuch bodies as in mixture have the greateſt ſhare of activity and motion. That internal agent in man, whereby all the vital motions neceſſary to the preſervation and reſtoration of the body are managed, is by ſome called *nature*; by others, *archæus, callidum innatum, animal ſoul, vital ſpirit*, or *principle*, &c.

AGENTS, in medicine, powers which act upon the body, in contradiſtinction from aliments, which are ſuppoſed rather to be acted on, than to act.

AGER, in Roman antiquity, a certain portion of land, allowed to each citizen. In the early days of the Roman ſtate, the ager was only two jugera, amounting to 1¼ Engliſh acre. After the expulſion of the kings, ſeven jugera were allowed to a plebeian. See AGRARIAN LAWS. Ager is alſo uſed by writers of the middle age, for what we now call an acre.

AGERATUM, BASTARD HEMP AGRIMONY, a genus of the polygamia æqualis order, belonging to the ſynegeſia claſs of plants; and in the natural method ranking under the 49th order, Compoſitæ diſcoides. The characters are: The common calyx is oblong, with many ſcales. The compound corolla is uniform: the corollets are hermaphrodite, tubular, and numerous: the proper corolla is funnel ſhaped; the border four-cleft, and expanded. The ſtamina conſiſt of five capillary very ſhort filaments; the anthera is cylindric and tubular. The piſtillum is an oblong germen, with a filiform ſtylus, and two ſlender erect ſtigmata. There is no pericarpium; the calyx unchanged. The ſeeds are ſolitary, oblong, and angular. The recepticulum is naked, convex, and very ſmall. Of this genus there are three ſpecies, viz. 1. AGERATUM ALTISSIMUM; 2. AGERATUM CONYZO-

IDES: 3. Ageratum houſtonianum: all natives of warm climates.

AGGA, or Agonna, a country on the Gold Coaſt of Guinea, in which there is a very high hill, called the Devil's mount, which is ſuppoſed to contain a great deal of gold. The Engliſh have a fort in it.

AGGELATION, *n. s.* concretion of ice.

AGGENERATION, *n. s.* the ſtate of growing or uniting to another body.

AGGER, in ancient authors, denotes the middle part of a military road, raiſed into a ridge with a gentle ſlope on each ſide, to make a drain for the water, and keep the way dry. The term was alſo uſed for the whole road, or military way.—Where highways were to be made in low grounds as between 2 hills, the Romans uſed to raiſe them above the adjacent land, ſo as to make them level with the hills. Theſe banks they called *aggeres.* Bergier mentions ſeveral in Gallia Belgica, which were thus raiſed, 10, 15, or 20 feet above ground.—They are ſometimes alſo called *aggeres calceati;* and are now generally known by the name *chouſſees*, or *cauſeways.*

Agger, in the ancient military art, a work of fortification, uſed both for the defence and the attack of towns, camps, &c. In which ſenſe it is the ſame with what was otherwiſe called *vallum*, and in latter times *aggeſtum;* and among the moderns *lines*, ſometimes *cavaliers*, *terrasses*, &c. The agger was uſually a bank, or elevation of earth or other matter, bound and ſupported with timber; having ſometimes turrets on the top, wherein the workmen, engineers, and ſoldiers, were placed. It was alſo accompanied with a ditch, which ſerved as its chief defence. The uſual materials of which it was made, were earth, boughs, faſcines, ſtakes, and even trunks of trees, ropes, &c. variouſly croſſed, and interwoven ſomewhat in the figure of ſtars; whence they were called *ſtellati axes.* Where theſe were wanting, ſtones, bricks, tiles, &c. ſupplied the place. We even read of aggers formed of the carcaſes of the ſlain; ſometimes of dead bones mixed with lime; and even with the heads of ſlaughtered citizens. For want of the due binding or ſolid materials, aggers have ſometimes tumbled down, with infinite miſchief to the men. The beſiegers uſed to carry on a work of this kind nearer and nearer towards the place, till at length they reached the very wall. The methods taken on the other ſide, to defeat them, were by fire, eſpecially if the agger were of wood; by ſapping and undermining, if of earth; and in ſome caſes, by erecting a counter agger. The height of the agger was frequently equal to that of the wall of the place. Beſides the uſe of aggers before towns; the generals uſed to fortify their camps with ſuch works: for want of this precaution, armies have often been ſurpriſed and ruined. There were vaſt aggers made in towns and places on the ſea-ſide, fortified with towers, caſtles, &c. Thoſe made by Cæſar and Pompey at Brunduſium are famous. Sometimes aggers were even built acroſs arms of the ſea, lakes, and moraſſes; as was done by Alexander before Tyre, and by M. Antony and Caſſius. The wall of Severus, in the north of England, may be conſidered as a grand agger, to which belong ſeveral leſs ones. See Severus's Wall.

To AGGERATE, *v. a.* to heap up.

AGGEROSE, *adj.* full of heaps.

AGGESTED, *adj.* heaped up.

To AGGLOMERATE, *v. a.* 1. To gather up in
as thread.—2. To gather together.

AGGLUTINANTS, *n. s.* Thoſe medicines, or
tions which have the power of uniting parts togeth

Agglutinants, more particularly comprehen
claſs of ſtrengthening medicines, whoſe office and e
to adhere to the ſolid parts of the body, and thus
and ſupply the place of what is waſted by the anim
tions. They are ſuch as are eaſily formed into jel
the principal ſimples which come under this claſs,
glaſs, olibanum, gum Arabic, dragon's blood, cat
vermicelli, pulſe, comfrey, plaintain, &c.

To AGGLUTINATE, *v. n.* To unite one par
ther; to join together, ſo as not to fall aſunder.
word almoſt appropriated to medicine.

AGGLUTINATION, *n. s.* [from *agglutinate.*]
coheſion; the act of agglutinating; the ſtate of b
glutinated.

Agglutination, in aſtronomy, the meeting o
more ſtars in the ſame part of the zodiac: alſo the
coalition of ſeveral ſtars, ſo as to form a nebulous ſ

AGGLUTINATIO PILORUM, a healing or
the hairs of the eye-lids, that grow inwards, to thei
ſituation. This may be done by maſtic applied with
which bends the hairs back into their proper orde
men, the ſlime of a ſnail taken off with a needle,
of hawk's weed, the liquor of agglutinants, or a
produce the ſame effect.

AGGLUTINATIVE, *adj.* That which has t
of procuring agglutination.

To AGGRANDIZE, *v. a.* To make great; to
to exalt; to improve in power, honour, or rank.

AGGRAMDIZEMENT, *n. s.* the ſtate of b
grandized; the act of aggrandizing.

AGGRANDIZER, *n. s.* the perſon who aggra
makes another great.

To AGGRAVATE, *v. a.* 1. to make heavy; uſe
a metaphorical ſenſe; as to aggravate an accuſati
puniſhment.—2. To make any thing worſe, by t
tion of ſome particular circumſtance, not eſſential.

AGGRAVATION, *n. s.* 1. The act of aggrav
making heavy.—2. The act of enlarging to eno
The extrinſical circumſtances or accidents, which
the guilt of a crime, or the miſery of a calamity.

AGGREGATE, *adj.* framed by the collection
particular parts into one maſs, body, or ſyſtem.

Aggregate, *n. s.* the complex, or collective
the conjunction or acervation of many particulars.

Aggregate, in botany, is a term uſed to expre
flowers, which are compoſed of parts or florets, ſo un
means, either of the receptacle or calyx, that no
them can be taken away, without deſtroying the for
whole. They are oppoſed to ſimple flowers, which
ſuch common part, and are uſually divided into ſeve
viz. the *aggregate*, properly ſo called, whoſe rece
dilated, and whoſe florets are ſupported by foot-ſtalk
are the blue daiſy, thrift, or ſea ſpink, &c. the co
the *umbellati*; the *cymoſe*; the *amentaceous*; the
and the *ſpadiceous.*

To AGGREGATE, *v. a.* to collect together;
mulate; to heap many particulars into one maſs.

AGGREGATION, *n. s.* 1. Collection, or ſtate of being collected.—2. The collection, or act of collecting many particulars into one whole.—3. The whole compoſed by the coacervation of many particulars; an aggregate.

Aggregation, in phyſics, a ſpecies of union, whereby ſeveral things which have no natural dependence or connection with one another are collected together, ſo as in ſome ſenſe to conſtitute one. Thus, a heap of ſand, or a maſs of ruins, are bodies of aggregation.

To **AGGRESS**. *v. n.* to commit the firſt act of violence; to begin the quarrel.

AGGRESSION, *n. s.* the firſt act of injury: commencement of a quarrel by ſome act of iniquity.

AGGRESSOR, *n. s.* the perſon who firſt commences hoſtility; the aſſaulter or invader, oppoſed to the *defendant.*

AGGRIEVANCE, *n. s.* injury; hardſhip inflicted; wrong endured.

To **AGGRIEVE**. *v. a.* 1. To give ſorrow; to cauſe grief; to vex —2. To impoſe ſome hardſhips upon; to harraſs; to hurt in one's right.

To **AGGROUP**, *v. a.* to bring together into one figure; to croud together: a term of painting.

AGHAST, *adj.* ſometimes written *agaſt.* Struck with horror, as at the ſight of a ſpectre; ſtupified with terror.

AGILE, *adj.* nimble; ready; active.

AGILENESS, *n. s.* the quality of being agile; nimbleneſs; readineſs for motion; quickneſs; activity; agility.

AGILITY, *n. s.* nimbleneſs; readineſs to move; quickneſs; activity.

AGILLOCHUM, *n. s.* Aloes wood. A tree in the Eaſt Indies, brought to us in ſmall bits, of a very fragrant ſcent. It is hot, drying, and accounted a ſtrengthener of the nerves in general. The beſt is of a blackiſh purple colour, and ſo light as to ſwim upon water.

AGINCOURT, a village of the French Netherlads, in the department of the Straits of Calais. Long. 77. 10. E. Lat. 50. 31. It has been rendered famous by the battle fought near it, wherein Henry V. defeated the French, in 1415; although the Engliſh army had to ſtruggle with every diſadvantage. After landing in France, it had been by various accidents reduced to 10,000 men. of whom not a few were ſick, or ſlowly recovering from ſickneſs;—they had to traverſe a long tract of country, inhabited by exaſperated enemies, from whom they were to procure proviſions, intelligence, and every thing they wanted;—that country was defended by many ſtrong towns, interſected by deep rivers, and guarded by an army of 100,000 men. Henry, undaunted by all theſe dangers and difficulties, departed from Harfleur, proceeding by very eaſy journeys, that he might not fatigue his troops, obſerving the ſtricteſt diſcipline, and paying generouſly for every thing he received; which induced the country people to bring proviſions to his camp, in ſpite of all the commands they had received to the contrary. To keep his men in ſpirits, and from repining, the king fared as ill as the meaneſt ſoldier, always appearing with a chearful countenance, and addreſſing them in the moſt friendly and encouraging language. They arrived at the vellage of Agincourt, on the evening of October 24th; and there beheld the whole French army, at a ſmall diſtance, directly in their route. The king took an attentive view of it, and being fully convinced, that it was impoſſible to proceed any further on his way to Calais without a battle, and equally impoſſible to return to Harfleur with ſo great a army in his rear, he reſolved to hazard an action next morning. Having during the night overheard ſome of his nobles expreſſing a wiſh, that the many brave men, who were idle in England, were preſent to aſſiſt them, Henry is ſaid to have cried out—"No! I would not have one man more:—if we are defeated, we are too many—if it ſhall pleaſe God to give us the victory, as I truſt he will, the ſmaller our number the greater our glory." The moon happening to ſhine very bright, Henry carefully examined the ground, and pitched upon a field of battle, admirably calculated to preſerve a ſmall army from being ſurrounded by a great one. It was a gentle declivity, of ſufficient extent for his ſmall army, defended on each ſide by hedges, trees, and bruſh-wood. The French, exulting in their numbers, confident of victory, and abounding in proviſions, ſpent the night in noiſy feſtivity, and in forming fanciful ſchemes about the diſpoſal of their priſoners and their booty. On the morning of the 25th of October, A. D. 1415, the Engliſh and French armies were ranged in order of battle, each in three lines, with bodies of cavalry on each wing. The Conſtable D'Albert, who commanded the French army, fell into the ſnare that was laid for him, by drawing up his army in the narrow plain between the two woods. This deprived him, in a great meaſure, of the advantage he ſhould have derived from the prodigious ſuperiority of his numbers; obliged him to make his lines unneceſſarily deep, about 30 men in file; to crowd his troops, particularly his cavalry, ſo cloſe together, that they could hardly move or uſe their arms; and, in a word, was the chief cauſe of all the diſaſters which followed. The king of England employed various arts to ſupply his defect of numbers. He placed 200 of his beſt archers in ambuſh, in a low meadow, on the flank of the firſt line of the French. His own firſt line conſiſted wholly of archers, four in file; each of whom, beſides his bow and arrows, had a battle-axe, a ſword and a ſtake pointed with iron at both ends, which he fixed before him in the ground, the point inclining outwards, to protect him from the cavalry; which was a new invention, and had a happy effect. The lines being formed, the king, in ſhining armour, and mounted on a fine white horſe, rode along them, and addreſſed each corps with a chearful countenance and animating ſpeeches. To enflame their reſentment againſt their enemies, he told them, that the French had determined to cut off three fingers of the right hand of every priſoner; and to rouſe their love of honour, he declared, that every ſoldier in that army who behaved well, ſhould henceforth be deemed a gentleman, and be entitled to bear coat-armour. When the two armies were drawn up in this manner, they ſtood a conſiderable time gazing at one another in ſolemn ſilence. But the king, dreading the French would diſcover the danger of their ſituation and decline a battle, commanded the charge to be ſounded, about 10 o'clock in the forenonn. At that inſtant, the firſt line of the Engliſh diſcharged a flight of arrows, which did great execution among the crowded ranks of the French. Immediately after, the archers in ambuſh aroſe, and diſcharged their arrows on the flank of the French line, and threw it into ſome diſorder. The battle now became general, and raged with uncommon fury. The Engliſh archers, having expended all their arrows, threw away their bows, and, ruſhing forward, made dreadful havoc with their ſwords and battle-axes. The firſt line of the enemy was, by theſe means, defeated ; its leaders being either killed or taken priſoners. The ſecond line, commanded by the duke D'Alencon, (who had vowed either to kill or take the king of England, or to periſh in the attempt) now advanced to the charge, and was encountered by the ſecond line of the Engliſh, conducted by the king. This conflict was more cloſe and furious than the former. The duke D'Alencon forced his way to the king, and aſſaulted him with great fury ; but that prince brought him to the ground, where he was inſtantly diſpatched. Diſcouraged by this diſaſter, the ſecond made no more reſiſtance ; and the third fled without ſtriking a blow ; yielding a complete victory to the Engliſh, after a violent ſtruggle of three hours. The king did not permit his men to purſue the fugitives to a great diſtance, but encouraged them to take as many priſoners as they could on or near the field ; in which they were ſo ſucceſsful, that in a little time, his captives were more numerous than his ſoldiers. A great proportion of theſe priſoners were men of rank and fortune, among whom were the dukes of Orleans and Bourbon, the martial Boucicaut, and 7000 barons, knights, and gentlemen. The French left dead on the field of battle, the conſtable D'Albert, the dukes of Alencon, Brabant and Bar, the archbiſhop of Sens. 1 marſhal, 13 earls, 92 barons, 1500 knights, and a vaſt number of gentlemen, beſides ſeveral thouſands of common ſoldiers. The Engliſh cotemporary writers affirm that the loſs of their countrymen, in this memorable action, did not exceed 100 ; and even the French hiſtorians make it very inconſiderable

AGIO, *n. s.* [An Italian word, ſignifying eaſe or conveniency.]—A mercantile term, uſed chiefly in Holland and Venice, for the difference between the value of bank notes, and the current money.

Agio, in Holland, is generally three or four *per cent.* and at Rome it is from 15 to 20 *per cent.* but at Veneice the agio is fixed at 20 *per cent.*

AGITABLE, *adj.* that which may be agitated, or put in motion ; perhaps that which may be diſputed. See Agitate and Agitation.

To AGITATE, *v. a.* 1. To put in motion ; to ſhake ; to move nimbly.—2. To be the cauſe of motion ; to actuate ; to move.—3. To affect with perturbatien ; as, the mind of man is *agitated* by various paſſions.—4. To ſtir ; to bandy from one to another ; to diſcuſs ; to controvert.—5. To contrive ; to revolve ; to form by labourious thought.

AGITATION, *n. s.* 1. The act of moving or ſhaking any thing.—2. The ſtate of being moved or agitated.—3. Diſcuſſion ; controverſial examination.—4. Violent motion of the mind ; perturbation ; diſturbance of the thought.—5. Deliberation ; contrivance ; the ſtate of being conſulted upon.

Agitation, in medicine, is a ſpecies of exerciſe called *swinging*, and in general any exerciſe which ſhakes the body. Maurice, prince of Orange, found this method a relief againſt the ſevere pains of the gout and ſtone. Bartholine mentions fits of the toothach, deafneſs, &c. removed by vehement agitations of the body ; and they have been found of ſpecial uſe for preventing and diſſolving concretions. Dr. Sydenham attributes the great benefits of riding to agitation, which is very efficacious in removing obſtructions of the viſcera.

Agitation, in phyſics, is often uſed for an inteſtine commotion of the parts of a natural body. Fermentation and effervescence are attended with a briſk agitation of the particles. It is one of the chief cauſes or inſtruments of mixtion : by the agitation of the parts of the blood and chyle, in their continual circulation, ſanguification is in a good meaſure effected. Butter is made out of milk by the ſame means : in which operation, a ſeparation is made of the oleous parts from the ſerous, and a conjunction of the oleous together. Digeſtion itſelf is only ſuppoſed to be an inſenſible kind of agitation. Agitatiou has been reputed one of the ſymptoms of inſpiration. We accordingly find, that in different ages of the world, ſome whilſt engaged in religious worſhip, have been ſubject to violent agitations of the body. We might, in particular, mention the Pythian prieſteſſes in ancient times, and the ſect called the Shakers among us. Petit informs us, that in the laſt century, there aroſe in a church in Italy, for the ſpace of a year, a vapour of an extraordinary kind, which put all the people into tremblings and agitations, and unleſs they got away betimes, ſet them a dancing, with ſtrange contortions and geſticulations.

AGITATOR, *n. s.* he who agitates any thing ; he who manages affairs.

AGLED, or Aglet, *n. s.* 1. A tag of a point curved into ſome repreſentation of an animal, generally a man.—2. The pendants at the ends of the chives of flowers, as in tulips.

AGMEN, in antiquity, a Roman army in march : in which ſenſe, it ſtands contradiſtinguiſhed from *acies*, which denoted the army in battle array : though, on ſome occaſions, we find the two words uſed indifferently for each other. The Roman armies, in their marches, were divided into *primum agmen*, anſwering to our van guard ; *medium agmen*, our main body ; and *postremum agmen*, the rear guard.

Agmen pilatum, an army diſpoſed in a narrow oblong form, or column ; being withall cloſe and compact ; thus called, as reſembling the figure of a *pila*, or *pier*. This form was chiefly uſed in marching without their baggage, through bad ways, and cloſe countries.

Agmen quadratum, an army arranged in a ſquare form, the method ordinarily obſerved in the Roman armies. This was alſo called *agmen grave*. The three columns, in which the army uſually marched, were conſiderably more in length, or breadth, than in depth : but as the baggage marched in the ſame order, the whole approached to the figure of a ſquare.

AGMINAL, *adj.* belonging to a troop.

AGNACAT, a ſpecies of pear tree, that grows in America, beyond the Terra de Labrador, toward the iſthmus of Darien. It is of the figure and ſize of a pear tree, always covered with leaves, and of an extraordinary greenneſs and luſtre. It bears a fruit alſo like a pear, but green even when it is ripe ; the pulp is of the ſame colour, and taſtes ſweet and ſomewhat like butter. It is ſaid to be a powerful promoter of veneral vigour.

AGNAIL, *adj.* a diſeaſe of the nails : a whitlow : an inflammation round the nails.

AGNANTHUS, in botany, a genus of plants, called Cornutia, by Linnæus.

AGNESELT, one of the Scilly Iſlands.

AGNINA, in botany, lamb's tongue or plantain.

Agnina lactuca. See Lactuca.

AGNITION, *n. s.* acknowledgment.

AGNOMEN, in antiquity an epithet given to a perſon, either by way of praiſe or diſpraiſe, or from ſome remarkable event, which became as it were, an additional name, but peculiar to the perſon, and not deſcendible to his iſſue.—Thus, one of the Scipios obtained the agnomen of *Africanus*, and the other of *Aſiaticus*, from the brave achievements which the one performed in Africa, and the other in Aſia. The Agnomen was generally the third in order, and ſometimes the fourth of the Roman names, but it was always ranked laſt, even when there were more of them. Thus, in Marcus Tullius Cicero, Marcus is the prænomen, Tullius the nomen, and Cicero the agnomen. But in the caſe of the Scipios, who had previouſly three names each, viz. Publius Cornelius Scipio, the agnomen was the fourth, and the third Scipio was ſtiled the cognomen, and was heritable, like the nomen or family name. The Emperor Antonius, not to multiply inſtances, had five names, viz. Marcus Ælius Aurelius Antonius Boionius; of which he received the ſecond by adoption from his predeceſſor Adrian, the 3d and 4th by deſcent, and the 5th was the agnomen, acquired by a victory over the Boionii.

AGNUS, a lamb, in zoology, the young of the ovis or ſheep. See Ovis.

Agnus Dei, in the church of Rome, a cake of wax, ſtamped with the figure of a lamb, ſupporting the banner of the croſs. Theſe being conſecrated by the Pope with great ſolemnity, and diſtributed among the people, are ſuppoſed to have great virtues; ſuch as, to preſerve thoſe who carry them *worthily*, and with *faith*, from all manner of accidents; to expel evil ſpirits, &c. The name literally ſignifies *Lamb of God*; this being ſuppoſed an image or repreſentation of the Lamb of God who took away the ſins of the world.—*Agnus Dei* is alſo a popular name for that part of the maſs wherein the prieſt, ſtriking his breaſt three times, rehearſes a prayer beginning with the words *Agnus Dei*.—The *Agnus Dei* is ſaid to have been firſt brought into the miſſal by pope Sergius I.

AGO, *adj.* Paſt; as *long ago*; that is, long time has paſt ſince. Reckoning time towards the preſent, we uſe *ſince*; as, it is a year *ſince* it happened: reckoning from the preſent, we uſe *ago*; as, it happened a year ago.

AGOG, *adv.* 1. In a ſtate of deſire; in a ſtate of warm imagination; heated with the notion of ſome enjoyment; longing; ſtrongly excited.—2. It is uſed with the verbs *to be*, or *to ſet*; as, he *is agog*; or you may *ſet* him *agog*.

AGOING, *part. adv.* [from *a* and *going*.] In action; into action.

AGON, an iſland in Sweden, with a good harbour for ſhipping.

AGONE, *adv.* Ago; paſt.

AGONISTES, *n. s.* A prize-fighter; one that contends at any public ſolemnity for a prize. *Milton* has ſo ſtyled his tragedy, becauſe *Samſon* was called out to divert the Philiſtines with feats of ſtrength.

AGONIZE, *v. n.* to feel agonies; to be in exceſſive pain.

AGONUS, in ichthyology, a name uſed by the generality of authors, for the fiſh called by ſome *ſarachus*, by others, *chalcis* and *ſardella*. It is in many particulars very like the alouſa, or ſhad, called the mother of herrings, but ſmaller, never arriving at more than a foot in length; and is always lean and lank in ſpring, and fat in autumn. But the diſtinctions between it and the alouſa, if real, are ſo very ſmall, that Mr. Ray, and many of the moſt accurate naturaliſts have ſuſpected it to be the ſame fiſh, only in a different ſtate.

AGONY, *n. s.* 1. The pains of death; properly the laſt conteſt between life and death.—2. Any violent or exceſſive pain of body or mind.—3. It is particularly uſed in devotions for our Redeemer's conflict in the garden.

Agony of Death. Much of the terror of death ariſes from the pangs and convulſions wherewith the agnony ſeems attended; though we have reaſon to believe that the pain in ſuch caſes is ordinarily not extremely acute; a courſe of pain and ſickneſs having uſually ſtupified and indiſpoſed the nerves for any quick ſenſation. However, various means have been thought of for mitigating the agony of death. Lord Bacon conſiders this as part of the province of a phyſician; and that not only when ſuch a mitigation may tend to a recovery, but alſo when, there being no further hopes of a recovery, it can only tend to make the paſſage out of life more calm and eaſy. Complacency in death which Auguſtus ſo much deſired, is certainly no ſmall part of happineſs. Accordingly the author laſt cited ranks *euthanaſia*, or the art of dying eaſily, among the deſiderata of ſcience. Opium has been applied for this purpoſe, with the approbation of ſome, but the condemnation of more. Baglivi publiſhed a treatiſe on the method of treating thoſe in the agonies of death; but, perhaps one of the beſt *receipts* for that end, is that of Mr. Patin, viz. *abſtinence from all medicine*. To this, we ſhall take the liberty of adding, that the beſt way of preparing ourſelves againſt the agonies of death, is to live in ſuch a manner, that we need not be afraid to die.

AGOSTA, a ſea port town in Sicily, with an excellent harbour. The greater part of it was ſwallowed up by an earthquake in 1763. Long. 90 15, E. Lat. 37 35, N.

AGOUTY, *n. s.* an animal of the Antilles, of the bigneſs of a rabbit, with bright red hair, and a little tail without hair. He has but two teeth in each jaw, holds his meat in his forepaws like a ſqirrel, and has a very remarkable cry. When he is angry, his hair ſtands on end, and he ſtrikes the earth with his hind feet, and when chaſed, he flies to a hollow tree, whence he is expelled by ſmoke.

AGRA, a province of Hindoſtan, belonging to the Great Mogul. Its capital, which likewiſe bears the ſame name, is looked upon as the largeſt city in theſe parts, and is in the form of a half moon. A man on horſeback can hardly ride round it in a day. It is ſurrounded with a wall of red ſtone and with a ditch 100 feet wide. The palace is prodigiouſly large, and the ſeraglio commonly contains, or rather confines above 1000 women. There are upwards of 800 baths in this town; and 700 moſques; but that which travellers moſt admire, is the mauſoleum of one of the Mogul's wives, which was 20 years in building. Laſt century the trade of this place was very flouriſhing. The Perſians, Chineſe and Engliſh reſorted to it, and the Dutch had a factory in it. They dealt principally in ſcarlet, looking-glaſſes, ſilver, gold, lace, hardwares, cloths, and ſpices; but it has ſince greatly declined. The indigo of Agra is the moſt valuable of all that comes from the Eaſt Indies. This town is ſeated on the river Jamma, about 50 miles above its confluence with the Tehemel, and is 100 miles S. by E. of Delhi, and 300 miles N. E. of Surat. Long. 153. 30. E. Lat. 27. 0. N.

AGRAMMATIST, *n. s.* an illiterate man.

AGRARIAN, *adj.* relating to fields or grounds: a word ſeldom uſed but in the Roman hiſtory, where there is mention of the agrarian law.

AGRARIAN LAWS, among the Romans, thoſe relating to the diviſion and diſtribution of lands; of which there were a great number; but that called the *Agrarian Law*, by way of eminence, was publiſhed by Spurius Caſſius, about the year of Rome 268, for dividing the conquered lands equally among all the citizens, and limiting the number of acres which each citizen might enjoy.—The Roman lands were of ſeveral kinds; ſome conquered from the enemies, and not yet brought to the public account; others brought indeed to the public, but clandeſtinely uſurped by private great men; laſtly, others purchaſed with the public money in order to be divided. Agrarian laws, either from dividing lands from the enemy, or the public lands, or thoſe purchaſed with the public money, were eaſily paſſed without diſturbance; but thoſe whereby private rich men were to be deprived of their lands, and the common people put in poſſeſſion of what had been held by the nobility, were never attempted without great diſturbances. Several have pleaded for the neceſſity of agrarian laws in Great Britain; but no author has entered ſo deeply into the ſubject as Mr. Harington in his *Oceana*; which the reader who chooſes may conſult.

To AGRESE, *v. a.* to daub; to greaſe; to polute with filth.

To AGREE, *v. n.* 1. To put an end to a varience.—2. to make friends; to reconcile.

To AGREE, *v. n.* 1. To be in concord; to live without contention; not to differ. 2. To grant; to yield to: to admit. 3. To ſettle amicably. 4. To ſettle terms by ſtipulation; to accord. 5. To ſettle a price between buyer and ſeller. 6. To be of the ſame mind or opinion. 7. To concur; to co-operate. 8. To ſettle ſome point among many. 9. To conſiſt; not to contradict. 10. To ſuit with; to be accommodated to. 11. To cauſe no diſturbance in the body.

AGREEABLE, *adj.* 1. Suitable to; conſiſtent with; conformable to. 2. Pleaſing; ſuitable to the inclination, faculties, or temper.

AGREEABLENESS, *n. s.* 1. Firſt conſiſtency with; ſuitableneſs to. 2. The quality of pleaſing. 3. Reſemblance; likeneſs.

AGREEABLY, *adv.* 1. Conſiſtent with; in a manner ſuitable to. 2. Pleaſingly.

AGREED, *participial adj.* ſettled by conſent.

AGREEINGNESS, *n. s.* conſiſtence; ſuitableneſs.

AGREEMENT, *n. s.* 1. Concord. 2. Reſemblance of one thing to another. 3. Compact; bargain; concluſion of controverſy: ſtipulation.

AGRESTIC, or AGRESTICAL, *adj.* having relation to the country; rude; ruſtick.

AGRICOLATION, *n. s.* culture of the ground.

AGRICULTURE, *n. s.* the art of cultivating the ground; tillage; huſbandry, as diſtinct from paſturage.

AGRICULTURE. For a particular account of the hiſtory, theory and practice of this moſt uſeful branch of Science.—See HUSBANDRY.

AGRICULTURE, ARTS and MANUFACTURES, A SOCIETY FOR THE PROMOTION OF, was incorporated by an act of the legiſlature of the ſtate of New-York, paſſed 12th. March, 1793. That the intention of this ſociety may be the better underſtood, we ſhall lay before our readers the ſubſtance of the petition, which the members laid before the legiſlature, when they ſolicited to be incorporated. In this they ſet forth, that "the petitioners, conſidering that the wealth and proſperity of a country very much depend upon the flouriſhing ſtate of its agriculture, arts and manufactures, and obſerving the benefits, which in other countries have accrued from the inſtitution of ſocieties for the purpoſe of encouraging theſe great objects, have voluntarily aſſociated themſelves, with a view of collecting from different parts of the ſtate, the different modes of agriculture that are in practice; to ſuggeſt ſuch improvements as may be found to be beneficial; to excite among their fellow citizens a ſpirit of making experiments for the amelioration of lands which have been exhauſted, or in their natural ſtate are unproductive or unfit for cultivation; for increaſing the product of ſuch articles as are propagated amongſt us, and promoting the culture of others, which have been found uſeful in other parts, and for the improvement of field huſbandy in general; and to introduce, as far as circumſtances may render proper, an emulation for the eſtabliſhment of uſeful arts and manufactures, in thoſe parts of the ſtate, where they can be beneficially carried on." The labours of this truly patriotic aſſociation have already been productive of great public utility; and they have publiſhed the reſult of their obſervations, under the title of "Agricultural Tranſactions;" to defray the expences of which the legiſlature in 1795, granted them the ſum of $ 100. In our account of AGRICULTURE, which ſhall be given under the head HUSBANDRY, we ſhall fully avail ourſelves of the Tranſactions of this ſociety, and of ſuch others as have been inſtituted for the ſame laudable purpoſe in different parts of the United States; as alſo of the treatiſes which have been written on the ſame ſubject by individuals. By theſe means, we hope to be able to lay before our readers a more complete ſyſtem of American huſbandry than has heretofore appeared.—Agricultural ſocietes have, likewiſe, been inſtituted in Pennſylvania, Maſſachuſetts, Maryland, &c. and we underſtand it is, at preſent, in contemplation that, a convention compoſed of delegates from the different ſtate ſocieties, ſhould meet at the ſeat of the general government for the purpoſe of more widely diffuſing the reſult of their reſpective obſervations.

AGRIGENTINE SALT, in natural hiſtory, a kind of eatable ſalt, famous among the ancients for its not cracking in the fire as common ſalt does. It might probably owe this quality to the fineneſs of the powder, in which form it was generally uſed.

AGRIGENTUM, an ancient city of Sicily, part of the ſite of which is now occupied by a town called *Girgenti*.—According to ancient authors, Dedalus, the moſt famous mechanic of fabulous antiquity, fled to this ſpot for protection againſt Minos, and built many wonderful edifices for Cocalus king of the iſland. Long after his flight, A. A. C. 600 the people of Gela ſent a colony hither; and from the name of a neighbouring ſtream, called it the new city *Arcragas*, whence the Romans formed their word *Agrigentum*.—Theſe Greeks converted the ancient abode of the Siculi into a citadel, to guard the magnificent city, which they erected on the hillocks below. An advantageous ſituation, a free government with all its happy effects, and an active commercial ſpirit, exalted their commonwealth to a degree of riches and power unknow to the Greek ſettlements, Syracuſe alone excepted. But the proſperity of Agrigentum appears to have been but of ſhort duration, and tyranny ſoon deſtroyed its liberties.

Agrigentum ancient history of. Phalaris was the firſt who reduced it to ſlavery. His name is familiar to moſt readers on account of his cruelty, and the brazen bull in which he tortued his enemies: (See Phalaris.)—He met with the common fate of tyrants, and after his death the Agrigentines enjoyed their liberty for 150 years, at the expiration of which, Thero uſurped the ſovereign authority. The moderation, juſtice and valour, of this prince preſerved him from oppoſition while living, and have reſcued his memory from the obloquy of poſterity. He joined his ſon-in-law Gelo, king of Syracuſe, in a war againſt the Carthaginians; in the courſe of which, victory attended all his ſteps, and Sicily ſaw herſelf for a time delivered from her African oppreſſors. Soon after his deceaſe, his ſon Thryſadeus was depoſed, and the old democratical government next. Ducetius next diſturbed the general tranquillity. He was a chief of the mountaineers, deſcendants of the Siculi; and was an overmatch for the Agrigentines, while they were unſupported by alliances, but ſank under the weight of their union with the Syracuſans. Some trifling differences diſſolved this union, and produced a war, in which the Agrigentines were worſted, and compelled to ſubmit to humiliating terms of peace. Reſentment led them to embrace with joy the propoſals of the Athenians, then meditating an attack upon Syracuſe. Their new friends ſoon made them feel, that the ſacrifice of liberty and fortune would be the price of their protection; and this conſideration brought them ſpeedily back to their old connections. But this reconciliation and its effects drew upon them the anger of the Carthaginians, by whom their armies were routed, their city taken, their race almoſt extirpated, and ſcarce a veſtige of magnificence was left. Agrigentum lay 50 years burried under its own ruins; when Timoleon, after triumphing over the Carthiginians, and reſtoring liberty to Sicily, collected the deſcendants of the Agrigentines, and ſent them to re-eaſtbliſh the dwellings of their forefathers. Their exertions were rewarded with aſtoniſhing ſucceſs; for Agrigentum roſe from its aſhes with ſuch a renewal of vigour, that in a very ſhort time we find it ſeiſing a lucky moment, when Agathocles and Carthage had reduced Syracuſe to the loweſt ebb, and arrogating to itſelf ſupremacy over all the Siclian republics. Xenodius was appointed the leader of this arduous enterpriſe; and had his latter operations been as fortunate as his firſt campaign, Agrigentum would have acquired ſuch a preponderance of reputation and power, that the rival ſtates would not even have dared to attack it. But a few brilliant exploits were ſucceeded by a ſevere overthrow, and the Agrigentines were obliged to ſue for peace to Agathocles. This commonwealth afterwards took part with Pyrrhus; and when he left Sicily to the mercy of her enemies, threw itſelf into the arms of Carthage. During the laſt Punic war, Agrigentum was the head-quarters of the Carthaginians, and was beſieged by the Roman Conſuls, who after eight months blockade took it by ſtorm. It neverthleſs changed maſters ſeveral times during the conteſt between theſe rival ſtates, and in every inſtance ſuffered moſt cruel outrages.

Agrigentum, modern history of. After the abovementioned period, very little of it occurs in hiſtory, nor do we know the preciſe time of the deſtruction of the old city, and the building of the new one. The principal part of the ancient city ſtood in the vale. The citadel ſtood on the mountain of Cocalus. Nothing could be more judicious in the choice of ſituation for a large city. The inhabitants were here provided with every requiſite for defence, pleaſure, and comfort of life; a natural wall formed by abrupt rocks, preſented a ſtrong barrier againſt aſſailants; pleaſant hills ſheltered them on three ſides, without impeding the circulation of air; before them a broad plain, watered by the Acagras, gave admittance to the ſea-breeze, and to a fine proſpect of that element; the port lay in view at the mouth of the river, and probably the road acroſs the flat was lined with gay and populous ſuburbs. The hoſpitality for which the Agrigentines are celebrated in hiſtory, was ſupported by an extenſive commerce; by means of which, the commonwealth was able to reſiſt many ſhocks of adverſity, and always to riſe again with freſh ſplendour. It was, however, cruſhed by the general fall of Grecian liberty; and the feeble remnants of its population which had ſurvived ſo many calamities, were at length driven out of its walls by the Saracens, and obliged to lock themſelves up for ſafety among the bleak and inacceſſible rocks of the preſent city.

Agrigentum, ruins of. The preſent town, Girgenti, occupies the mountain on which the ancient citadel ſtood. At the N. E. angle of the ancient limits, upon ſome foundations of large regular ſtones, a church has been erected; a road appears hewn in the ſolid rock for the convenience of the votaries that viſited this temple in ancient days. It was then dedicated to Ceres and her daughter Proſerpine, the peculiar patroneſſes of Sicily. Biſhop Blaiſe has ſucceeded to their honours. At the S. E. corner, where the ground, riſing gradually, ends in a bold eminence, which is crowned with majeſtic columns, are the ruins of a temple ſaid to have been conſecrated to Juno. To the W. of this, ſtands the building commonly called the *Temple of Concord*; the ſtone of which, and the other buildings, is the ſame as that of the neighbouring mountains and cliffs, a conglutination of ſea-ſand and ſhells, full of perforations, of a hard and durable texture, and a deep reddiſh brown colour. This Doric temple has all its columns, entablature, pediments, and walls, entire; only part of the roof is wanting. It owes its preſervation to the piety of ſome Chriſtians, who have covered half the nave, and converted it into a church conſecrated under the invocation of St. Gregory, biſhop of Girgenti. In the ſame direction are rows of ſepulchres cut in the rock. Some maſſes of it are hewn into the ſhape of coffins ; others drilled full of ſmall ſquare holes employed in a different mode of interment, and ſerving as receptacles of urns. One ponderous piece of it lies in an extraordinry poſition ; by the failure of its foundation, or the ſhock of an earthquake, it has been looſened from the general quarry, and rolled down the declivity, where it now remains ſupine with the cavities turned upwards. Only a ſingle column marks the confuſed heaps of moſs-grown ruins belonging to the temple of Hercules. It ſtood on a projecting rock above the chaſm in the ridge, which was cut through for a paſſage to the port. In the ſame tract, over ſome hills, is ſituated the *Tomb of Thero.* It is ſurrounded by aged olive-trees, which caſt a wild irregular ſhade over the ruin. The edifice inclines to the pyramidal ſhape, and conſiſts at preſent of a triple plinth, and a baſe ſupporting a ſquare pedeſtal : upon this plain ſolid foundation is raiſed a ſecond order, having a window in each front, and at each angle two Ionic pilaſters, crowned with an entablature of the Doric order. Its inſide is divided into a vault, a ground room, and one in the Ionic ſtory, communicating with each other by means of a ſmall internal ſtair-caſe. In the plain are ſeen the fragments of the temple of Æſculapius ; part of two columns and two pilaſters, with an intermediate wall, ſupport the end of a farm houſe, and were probably the front of the cells. Towards the weſt are the gigantic remains of the temple of Jupiter Olympus, minutely deſcribed by Diodorus Siculus. It may literally be ſaid, that it has not one ſtone left upon another ; and it is barely poſſible, with the help of much conjecture, to diſcover the traces of its plan and dimenſions. Diodorus calls it the largeſt temple in the whole iſland : but adds, that the calamities of war cauſed the work to be abandoned before the roof could be put on ; and that the Agrigentines were ever after reduced to ſuch a ſtate of poverty and dependance, that they never had it in their power to finiſh this ſuperb monument of the taſte and opulence of their anceſtors. The length of this temple was 370 Greek feet, its breadth 60, and its height 220, excluſive of the foundations, the extent and ſolidity of its vaults and underworks, its ſpacious porticoes and exquiſite ſculpture were ſuited to the grandeur of the whole. The next ruin belongs to the temple of Caſtor and Pollux ; vegetation has covered the lower parts of the building, and only a few fragments of columns appear between the vines. This was the point of the hill where the wall ſtopt on the brink of a large fiſh-pond, ſpoken of by Diodorus : it was cut in the ſolid rock 30 feet deep, and water was conveyed to it from the hills. In it was bred a great quantity of fiſh for the uſe of public entertainments ; ſwans and various other kinds of wild fowl ſwam along its ſurface, for the amuſement of the citizens, and the great depth of water prevented an enemy from ſurpriſing the town on that ſide. It is now dry and uſed as a garden. On the oppoſite bank are two tapering columns without their capitals, placed in a tuft of carob trees. Monte Toro, where Hanno encamped with the Carthaginian army, before the Roman Conſuls drew him into an engagement that ruined his defenſive plan, is a noble back ground to this pictureſque group of objects. The whole ſpace comprehended within the walls of the ancient city, abounds with traces of antiquity, foundations, brick arches, and little channels for the conveyance of water ; but in no part are any ruins that can be preſumed to have belonged to places of public entertainments. This is the more extraordinary, as the Agrigentines were fond of ſhows and dramatic performances, and the Romans never dwelt in any place long without introducing their ſavage games. See GIRGENTI.

AGRIMONIA, AGRIMONY : A genus of the digynia order, beloning to the duodecandria claſs of plants ; and in the natural method ranking under the 35th order, Senticoſæ. The characters are theſe : The calyx is a monophyllous perianthium, divided into five acute ſegments perſiſtent, and fenced with another calyx : The corolla conſiſts of five petals, flat, and crenated at the ends : The ſtamina have ten capilary filaments, ſhorter than the coralla, and inſerted into the calyx : the antheræ are ſmall, didymous, and compreſſed : The piſtillum has a germen beneath ; the ſtyli are two, ſimple, and the length of the ſtamina : There is no pericarpium ; the calyx is contracted in the neck, and indurated : the ſeeds are two, and roundiſh. Of this genus there are five ſpecies enumerated by botanical writers ; but none of them have any remarkable properties except the two following.

Species and properties. 1. AGRIMONIA EUPATORIA, or common agrimony, grows natural in the woods. It is eat by ſheep and goats, but refuſed by horſes and ſwine. The Canadians are ſaid to uſe an infuſion of the root in burning fevers with great ſucceſs. An infuſion of ſix ounces of the crown of the root in a quart of boiling water ſweetened with honey, and half a pint of it drank three times a-day, is an effectual cure for the jundice, according to Dr. Hill. He adviſes to begin with a vomit, afterwards to keep the belly ſoluble, and to continue the medicine as long as any ſymptom of the diſeaſe remains. It is ſaid to be an aperient, detergent, and ſtrengthener of the viſcera. Hence it is recommended in ſcorbutic diſorders, in debility, and laxity of the inteſtines, &c. Digeſted in whey, it affords an uſeful diet drink for the ſpring-ſeaſon, not ungrateful to the palate or ſtomach. Dr Alſton ſays, that the beſt mode of adminiſtering this herb, is in powder, when the intention is to corroborate ; and that if thus taken in a large quantity, we may expect many of the effects of the bark from it in agues.

2. AGRAMANIA ODORATA, or ſweet ſcented agrimony. This grows near 4 feet high ; the leaves have more pinnæ than the former ; the ſerratures of the leaves are alſo ſharper, and, when handled, they emit an agreeable odour The leaves of this ſpecies make an agreeable cooling tea, which is ſometimes preſcribed by phyſicians as a drink for people in fevers. Both theſe ſpecies may be propagated either by ſeed, or by paring the roots in autumn when the leaves begin to decay. The ſeeds ought alſo to be ſeen in this ſeaſon : for if kept out of the ground till ſpring, they ſeldom come up that year. Agrimony is a hardy perennial plant, and will thrive in almoſt any ſoil or ſituation ; but the plants ſhould not be placed nearer one another than two feet, that the roots may have room to ſpread.

AGRIMONY, *n. s.* the name of a plant.—The leaves are rough, hairy, pennated, and grow alternately on the branches ; the flower cup conſiſts of one leaf, which is divided into five ſegments : the flowers have five or ſix leaves, and are formed into a long ſpike, which expand in form of a roſe ; the fruit is oblong, dry and prickly, like the burdock ; in each of which are contained two kernels.

Agrimony, Hemp. See Eupatorium.

Agrimony, Water Hemp. See Bidens.

AGRION. See Peucedanum.

AGRIPPINA colona ubiorum, in ancient geography, now *Cologne :* ſo called from Agrippina, who had a colony ſent thither by the emperor Claudius, to honor the place of her birth. See Cologne.

AGROM, a diſeaſe frequent in Bengal and other parts of the Indies, wherein the tongue chaps and cleaves in ſeveral places, is extremely rough, and ſometimes covered with white ſpots. The Indians are much afraid of this diſeaſe, which they attribute to extreme heat of the ſtomach. Their remedy is to drink ſome chylybeate liquor, or the juice of mint.

AGROSTEMA, Wild Lychnis, or Campion: A genus of the pentagynia order, belonging to the decandria claſs of plants ; and in the natural method ranking under the 22d order Coryophyllei. The characters are : The calyx is a ſingle leaved perianthium, leathery, tubular, quinquedentated, and perſiſtent : The corrolla conſiſts of five ilated petals : The ſtamina have ten ſubulated fila- its ; the antheræ are ſimple : The piſtillum has an egg- ed germen ; the ſtyli are five filiform, erect, and the le h of the ſtamina ; the ſtigmata are ſimple : The peri- s an oblong covered capſule, having two cells and valves : The ſeeds are numerous and kidney ſhaped ; receptacula are as many as the ſeeds, the interior ones ually longer. The moſt remarkable ſpecies are :

1. Agrostema coronaria, or ſingle-roſe campion. Of this ſpecies there are four varieties, one with deep red, er with fleſh-coloured, a third whith white, flowers ; a ſort with double flowers which has turned moſt of the others out of the gardens. This plant is eat by horſes, , and ſheep.

2. Agrostema githago, hairy wild lychnis, or com- campion. The flowers appear in June, are generally e, ſometimes white, and by cultivation yellow. It is annual plant, but, as it is found naturally in the fields, is ſeldom cultivated in gardens.

3. Agrostema jovis, or umbelliferous mountain on, grows naturally upon the Helvetian mountains.— It is a low plant with woolly leaves : the flower ſtem riſes r a foot high ; the flowers grow in umbels on the top of ſtalk, and are of a bright red colour. They appear in July, and the ſeeds ripen in September. This is alſo an an- l plant, and therefore muſt be propagated by ſeeds. It have a ſhady ſituation, and thrives beſt in a ſtrong u

AGROUND, *adv.* 1. Stranded ; hindered by the ground paſſing farther.—2. It is likewiſe figuratively uſed g hindered in the progreſs of affairs ; as, the nego- tors *aground* at that objection.

AGUAGUIN, in botany, the name of a ſhrub among the A tans, who eſteem it greatly as a balſamic and anti-vul- ry. The leaves of this ſhrub reſemble thoſe of our com- m lilac ; they grow alternately, and ſtand upon foot-ſtalks half an inch long : and when held up to the light, they ew a fine texture of the ſmaller veins. *Philoſophical Tranſactions.* No. 232.

AGUARA-PONDA, in botany, a plant otherwiſe called *viola ſpicata Braſiliana.* It grows to the height of a foot and an half, or more, with a ſmooth, round, green, and jointed ſtalk. At each joint come forth four, five, or more, narrow, ſerrated, pointed, green, and unequal leaves. The top of the ſtalk bears an ear a foot long, ſmooth, and covered with flowers of a fine violet azure, or the colour of our *viola martia*, conſiſting of five roundiſh leaves. The whole flower is not unlike the *viola martia*, and has ſomewhat of its ſmell. The root is ſtraight, of a moderate thickneſs, and ſhoots out into abundance of leſſer ones, and theſe again into filaments. There is another kind, diſtinguiſhed by the wideneſs of its ear of flowers, which repreſents a helmet of a green colour. It is marked with cubic pits, from whence proceed azure flowers.

AGUE, *n. s.* an intermitting fever, with cold fits ſucceeded by hot. The cold fit is, in popular language, more particularly called the *ague*, and the hot, the fever.

Ague, a general name for all periodical fevers, which, according to the different times of the returns of the feveriſh parixiſm, are denominated tertian, quartan, and quotidian. For a deſcription of the cauſes, prognoſtics and cure of this diſorder. See Medicine.

Ague cake, a hard tumor on the left ſide of the belly, lower than the falſe ribs, ſaid to be the effect of intermitting fever.

AGUE fit, *n. s.* the paroxiſm of the ague.

Agueperse. See Aigueperse.

Ague proof, *adj.* [from *ague* and *proof.*] Proof againſt agues ; able to reſiſt the cauſe which produce agues, without being affected.

AGUISH, *adj.* having the qualities of an ague.

AGUISHNESS, *n. s.* the quality of reſembling an ague.

AGURA, in Jewiſh antiquity, the 20th part of a ſilver ſhekel. The *agurah* is the ſame with *gerah*, and *keſbitah.* The Septuagint tranſlation renders it *obolus.*

AGUTI, in zoology, an American animal, much reſembling the guinea pig, having the characters of the rat kind, with the voice and hair of the hog. The hairs are very hard, thick, and gloſſy, and are of a mixt colour, of a rediſh and brown, with more or leſs black ; thoſe on the belly, however, are yellowiſh ; its head and whiſkers are like thoſe of the rabbit kind, but that the noſe is ſharper, and the upper chop longer than the under one, as in the hog, kind ; the upper lip is ſplit as in the hare, and the legs are naked, or have at the utmoſt only a few hairs on them ; the fore feet have four toes, and the hinder ones ſix, and theſe are much longer than the fore legs ; its tail is very ſhort, its eyes prominent, and its voice altogether reſembles the grunting of a hog. It is a very voracious animal, devouring its food with extreme eagerneſs, and uſing its fore feet for hands in the manner of a ſqirrel. It runs very ſwiftly, and is very expert at digging, ſo that it ſoon buries itſelf in the earth. When provoked, it raiſes all the hairs of its back upright, and ſtrikes the earth with its hinder feet.— For a more particular deſcription, ſee Mus.

AGUTI TREVA, *inſulæ Marignanæ*, in botany, a plant mentioned by de Laet. It has the leaves of the orange tree, only thinner, a dewy flower, a large fruit, with a greeniſh rind, which contains kernels like thoſe of the pomegranate, thin, ſweet, and not ill-taſted.

AH, *Interjection*. 1. A word denoting ſometimes diſlike and cenſure.—2. Sometimes contempt and axultation.—3. Sometimes, and moſt frequently, compaſſion and complaint.

AHA! AHA! *Interjection*. A word intimating triumph and contempt.

AHANIGER, in ichthyology, a name given by Albertus, and others, to the fiſh called by authors, *acus vulgaris*, and by us the *gar fiſh*. The ſhape of this fiſh, which is very long and ſlender, has cauſed it to be confounded with the *ſyngnathus* or tobacco pipe fiſh, called alſo *acus*, but they differ extremely when examined; that being a true ſpecies of the *ſyngnathus* and this of the *eſox* or pipe.

AHEAD, *adv*. 1. Farther onward than another; a ſea-term.—2. Headlong, precipitantly.

Ahead, in ſea language, ſignifies not only further onward than the ſhip, but at any diſtance before her, lying immediately on that point of the compaſs to which her ſtern is directed. It is uſed in oppoſition to *aſtern*, which expreſſes the ſituation of any object behind the ſhip. See Astern.

AHEIGHT, *adv.* aloft; on high.

AHICCYATLI, in zoology, the name of an American ſerpent, approaching to the nature of the hæmorrhus and rattle-ſnake, but larger than the former, and wanting the rattle of the latter; It is as fatal in effect of its poiſon as any known ſpecies of ſerpent.

AHLDEN, a diſtrict of Lunenburgh, one of his Britannic Majeſty's dominions.

AHMELIA, in botany, is a ſpecies of bidens, or water-hemp agrimony. Its flowers are large, and reſemble thoſe of the marygold; they grow in large numbers on the tops of the ſtalk, and of the large branches, and are ſucceeded by oblong ſeeds, which have the ſame ſort of points at one end with thoſe of our common bidens, and all the other plants of that genus. The ſtalks are ſquare, and the leaves ſtand in pairs, and are in ſhape like thoſe of the common nettle. This plant, and the others of the ſame genus, are called by the name *bidens*, from the teets or prickles at the ends of the ſeeds; but the word ſhould be *tridens*, for there are three of them.

A-HULL, in ſea-language, the ſituation of a ſhip when all her ſails are furled on account of the violence of a ſtorm, and when, having laſhed her helm to the lee-ſide, ſhe lies nearly with her ſide to the wind and ſea, her head being ſomewhat inclined to the direction of the wind.

AI, in ancient geography, a town of Judea, N. from Jerico, called by Joſephus *Aina*, was originally a kingdom of the Canaanites, before it was captured by Joſhua. The particulars of the repulſe met with by the Iſraelites in their firſt attempt to take it, while Achan's crime remained concealed, of their manœuvres afterwards, by ambuſcades againſt it, together with their final ſucceſs, the hanging of its king, and the total extermination of its inhabitants, are recorded in the vii. and viii. chapters of Joſhua. Some critics pretend to find a diſcordance between the third verſe of the viii chapter, where 30,000 men are mentioned as "ſent away by night," and the 12th verſe, where it is ſaid, that "Joſhua took about 5000 men, and ſet them to lie in ambuſh." But this difficulty is eaſily ſolved, either by ſuppoſing with Maſius, that 5000 lay in wait, while 25,000 attacked the city; or with Calmet and moſt other interpreters, that two bodies are placed in ambuſcade, the one conſiſting of 25,000, and the other of 5000 men. Ai being burnt upon this occaſion, was rebuilt by the Benjamites, and, long after this period, was taken by Senacherib. After the captivity, it was rebuilt a ſecond time.—Nehem. xi. 31.

AIAIA, in ornithology, the name of a Braſilian bird, of the *platea*, or ſpoon-bill kind, called by the Portugueſe *colborado*: It is exactly of the ſame ſhape, and much of the ſame ſize with the European ſpoon-bill, and its beak is in the very ſame manner broad at the end. It is of a pale, but very bright and ſhining fleſh colour, on the back and wings; the other parts of its body are perfectly white; it is common about the ſhores of rivers, and its fleſh is very well taſted.

AJALON, or Aijalon, a town of the tribe of Benjamin, about three miles E. from Bethel, rendered memorable by Joſhua's victory over the five Canaanitiſh kings in the adjacent valley, and ſtill more ſo, by the extraordinary circumſtance attending it, of the miraculouſly lengthened day. Whether this was accompliſhed by an arreſtment of the earth's motion round its own axis, or by that of the rays of light proceeding from the ſun, and reflected from the moon, or by an illuſory appearance of theſe great luminaries above the horizon after their uſual time of ſetting, is impoſſible to determine. But while any, or all of theſe are within the bounds of poſſibility, thoſe who believe, that he, who eſtabliſhed the laws of nature, can alter or ſuſpend them at his pleaſure, will not readily liſten to the ſcoffs of infidels againſt this miraculous interpoſition of divine power.

AJAN, a coaſt and country of Africa, which has the river Quilmanci on the S. the mountains from which that river ſprings on the W. Abyſſinia, or Ethiopia, and the ſtraits of Babelmandel, on the N. and the Eaſtern, or Indian Ocean on the E. The coaſt abounds with all the neceſſaries of life, and has plenty of very good horſes. The kings of Ajan are often at war with the Abyſſinians; and all the priſoners they take, they ſell to the merchants of Cambaya, thoſe of Adan, and other Arabs, who come to trade in their harbours, or give them in exchange, coloured cloths, glaſs beads, raiſins, and dates; for which they alſo take bach, beſides ſlaves, gold and ivory. The whole ſea-coaſt, from Zanguebar to the Straits of Babelmandel, is called the coaſt of Ajan: and a conſiderable part of it is ſtyled the Deſart coaſt.

AICHSTAT, a town of Germany, in Franconia, and capital of a biſhopric of the ſame name. It contains ſeveral hoſpitals, a ſeminary for ſtudents, a cathedral and other churches, one of which is built after the model of the church called the Holy Sepulchre at Jeruſalem. It is remarkable for a curious piece of workmanſhip, called the Sun of the holy Sacrement, which is in the church. It is of maſſy gold, of great weight, and is enriched with 350 diamonds, 400 pearls, 250 rubies, and other precious ſtones. This place is moderately large, and ſeated in a valley on the river Altmul, 13 miles N. of Newburgh, and 30 S. of Noremberg. Long. 86. 10. E. Lat. 48. 57 N. The biſhopric is 45 miles in length and 17 in breadth; and the biſhop is chancellor of the church at Mentz.

To **AID**, *v. a.* to help; to ſupport; to ſuccour.

AID, *n. s.* 1. Help; ſupport.—2. The perſon who gives help or ſupport; a helper; auxiliary.

AID-DE-CAMP, in military affairs, an officer employed to receive and carry the orders of the general.

AIDER, *n. s.* he who brings aid or help; a helper; an ally.

AIDLESS, *adj.* helpleſs; unſupported; undefended.

AID-MAJOR, or ADJUTANT, is an officer whoſe buſineſs is to eaſe the major of part of his duty; and to perform it all in his abſence.

AIEREBA, in ichthyology, the name of a fiſh of the *paſtinacba marina* kind, but differing from all the others, in that the form of its body is regularly round, and its head placed far within the verge of its thin part. It is common in the Weſtern Ocean, but is not much eſteemed for the table, being more looſe and flabby in its fleſh than the other kinds.

AIGUE MARINE. See AQUA MARINA.

AIGUE-PERSE, a town of France, in the department of Puys-de-Dome, near which there is a very cold ſpring, which bubbles up with a ſtrong ebulition, and is fatal to animals that think it. It lies 18 miles N. of Clermont, and 26 S. of Paris. Long. 78. 20. E. Lat. 46. 6. N.

AIGUESCAUDES, or AIGUISCAUDES, a diſtrict of France, in the valley of Oſſua, and department of the Lower Pyrennes. It is remarkable for a warm ſpring, the waters of which are oily, ſaponaceous, and ſpiritous. They have a fœtid ſmell, and are uſed both internally and externally.

AIGUESMORTES, a town of France, in Lower Languedoc, in the department of the Mouths of the Rhone. It formerly ſtood near the ſea, and had a harbour, which is now choaked up, and the ſea has retired two French leagues from the town, leaving it in a moroſs, which howver ſerves as a ſtrong defence for it. Long. 79. 3. E. Lat. 43. 34. N.

AIGULET, *n. s.* a point with tags; points of gold at the end of fringes.

To **AIL**, *v. a.* 1. To pain; to trouble; to give pain. 2. To affect in any manner.—3. To feel pain; to be incommoded.

AIL, *n. s.* a diſeaſe.

AILESBURY, or ALESBURY, a borough town of Buckinghamſhire, England, ſituated in 51. 50. N. Lat. and 74. 18. E. Long. which though it contains only about 400 houſes ſends two members to Parliament, whilſt Birmingham and Mancheſter, the leaſt of which contains 60,000 inhabitants, are permitted to ſend none!

AILING, *part. adj.* ſickly; full of complaints.

AILMENT, *n. s.* pain; diſeaſe.

AILSA, an inſulated rock on the weſtern coaſt of Scotland, between the ſhores of Airſhire and Cantire. It is two miles in circumference at the baſe, is acceſſible only at one place, and riſes to a great height in a pyramidical form. A few goats and rabbits pick up a ſubſiſtence among the ſhort graſs and furze; but the importance of the rock conſiſts in the great variety and boundleſs numbers of birds, by which it is frequented, particularly the gannets, or ſolan geeſe, whoſe young are uſed at the beſt tables, and bring a good price. Other birds are caught for their feathers.

To **AIM**, *v. a.* 1. To endeavour to ſtrike with a miſſile weapon; to direct towards.—2. To point the view, or direct the ſteps towards any thing; to tend towards; to endeavour to reach or obtain.—3. To direct the miſſile weapon; more particularly taken for the act of pointing the weapon by the eye, before its diſmiſſion from the hand.—4. To gueſs.

AIM, *n. s.* 1. The direction of a miſſile weapon.—2. The point to which the thing thrown is directed.—3. A purpoſe; a ſcheme; an intention; a deſign.—4. The object of a deſign; the thing after which any other endeavours.—5. Conjecture; gueſs.

To **AIR**, *v. a.* 1. To expoſe to the air; to open to the air.—2. To take the air, or enjoy the open air.—3. To air liquors; to warm them by the fire.—4. To breed in neſts.

AIR, *n. s.* 1. The element encompaſſing the terraqueous globe.—2. The ſtate of the air, or the air conſidered with regard to health.—3. Air in motion; a ſmall gentle wind. 4. Scent; vapour.—5. Blaſt; peſtilential vapour.—6. Any thing light or uncertain; that is as light as air.—7. The open weather; air unconfined.—8. Vent; utterance; emiſſion into the air.—9. Publication; expoſure to the public knowledge.—10. Intelligence; information; not now in uſe.—11. Muſic, whether light or ſerious; ſound; air modulated.—12. Poetry; a ſong.—13. The mein, or manner, of the perſon; the look.—14. An affected or laboured manner or geſture; as, a lofty *air*, a gay *air*.

AIR, by natural philoſophers, is defined to be a thin, fluid, elaſtic, tranſparent, ponderous, compreſſible, and dilatable body, ſurrounding the terraqueous globe, to a conſiderable height. See AEROLOGY, ATMOSPHERE, and PNEUMATICS: and for Impregnation *of Water with Fixed* AIR, &c. ſee MINERAL WATERS.

AIR, in medicine, &c. makes one of the ſix non-naturals. From obſervations on bleeding in rheumatiſms, and after taking cold, it is evident the air can enter with all its qualities, and vitiate the whole texture of the blood and other juices.—From the palſies, vertigoes, and other nervous affections cauſed by damps, mines, &c. it is evident, that air thus qualified can relax and obſtruct the whole nervous ſyſtem. And from the colics, fluxes, coughs, and conſumptions produced by damp, moiſt, and nitrous air, it is evident that it can corrupt and ſpoil the noble organs, &c.

AIR, in muſic, is taken in different ſenſes. It is ſometimes contraſted with harmony; and in this ſenſe, it is ſynonymous with melody in general. Its proper meaning is, a tune, which is ſet to words, or to ſhort pieces of poetry which are called ſongs. In operas, we give the name of air to ſuch pieces of muſic, as are formed with meaſures and cadences, to diſtinguiſh it from the recitative; and, in general, every piece of muſic is called an air, which is formed for the voice, or even for inſtruments, and adapted to ſtanzas, whether it forms a whole in itſelf, or whether it can be detached from any whole of which it forms a part, and be executed alone.—If the ſubject admits of harmony, and is ſet in parts, the air is, according to their number, denominated a *duett*, a *trio*, a *quartetto*, &c. In modern muſic, there are ſeveral different kinds of airs, each of which agrees to a certain kind of dancing, and from theſe dances, the airs themſelves take their ſpecific names.—The airs of operas, are, if we may be permitted the expreſſion, the canvas or ſubſtratum, upon which are painted all the pictures of imitative muſic; melody is the deſign, and harmony the colouring; every pictureſque object ſelected from the moſt beautiful parts of nature, every reflected ſentiment of the human heart, are the models which the artiſt imitates; whatever gains attention, whatever intereſts the ſoul, whatever charms the ear, or cauſes emotion in the heart, theſe are the objects of his imitation. See Imitation. The words to which airs are adapted, are not always rehearſed in regular ſucceſſion, nor ſpoken in the ſame manner with thoſe of the recitative; and though in general, they are very ſhort, yet they are interrupted, repeated, tranſpoſed, at the pleaſure of the artiſt. They do not conſtitute a narrative, which once told is over: they either delineate a picture, which it is neceſſary to contemplate in different points of view; or inſpire a ſentiment in which the heart acquieſces with pleaſure, and from which it is neither able nor willing to be diſengaged: and the different phraſes of the air, are nothing elſe but different manners of beholding the ſame image. This is the reaſon why the ſubject of an air ſhould be one. It is by theſe repetitions properly placed, it is by theſe redoubled efforts, that an impreſſion, which at firſt was not able to move you, at length agitates you, tranſports you out of yourſelf: and it is likewiſe upon the ſame principle, that the runnings, as they are called, or thoſe long, mazy, and inarticulated inflections of the voice, which, in pathetic airs, frequently ſeem, though they are not always ſo, improperly placed; whilſt the heart is affected with a ſentiment exquiſitely moving, it often expreſſes its emotions by inarticulate ſounds, more ſtrongly and ſenſibly than it could do by words themſelves. The form of airs is of two kinds. The ſmall airs are often compoſed of two ſtrains, which ought, each of them to be ſung twice; but the important airs in operas are frequently in the form of rondeaus.

Air, in mythology, was adored by the heathens, under the names of Jupiter and Juno; the former repreſenting the ſuperior and finer part of the atmoſphere, and the latter the inferior and groſſer part. The augurs alſo drew preſages from the clouds, thunder, lightning, &c.

Air, in the menage, artificial motion of a taught horſe; as the demivolt, curvet, capriole, &c.

Air, circulation of, in rooms. To render the circulation of air ſenſible, let the air of a room be heated by a ſtrong fire, whilſt the air of a contiguous room is cold; then let the door between theſe two rooms be opened, in which caſe the hot air of one room being lighter, will paſs through the upper part of the opening of the door into the cold room; and, on the contrary, the cold air of the other room being heavier, will paſs into the former room through the lower part of the opening; accordingly, it will be found, that applying a lighted candle at the top, in the middle, and at the lower part of the opening between the two rooms, a ſtrong current of air will appear to paſs from the hot into the cold room near the top; a contrary current of air will appear to paſs from the latter into the former room near the lower part of the ſaid opening; as may be clearly perceived by the direction of the flame of the candle, whilſt in the middle there is little or no motion at all. It is for the ſame reaſon, that when the fire is lighted in a grate, a ſtrong current of air is occaſioned to enter the room, which may be felt by applying the hand near the key-hole, or other ſuch ſmall opening, if the doors and windows are ſhut: for the air over the fire, being heated, becomes lighter, and aſcends into the chimney; conſequently other colder air muſt ſupply its place, which forces its way thro' all the ſmall openings it can find. Were a room with a fire in it to be perfectly cloſed, excepting the chimney, the air in it would ſoon become unwholeſome for reſpiration, and the fire would be ſoon extinguiſhed, beſides other inconveniences. Hence it appears, that thoſe perſons miſtake, who expect to keep the air of a room ſweet and wholeſome, eſpecially for convaleſcents, by accurately ſtopping all the ſmalleſt openings that admit freſh air. When the current of air that enters into a room is on ſome ſide of it, where it falls immediately upon the perſons who ſit in the room, then it may be offenſive, eſpecially to delicate conſtitutions. In that caſe, ſuch opening ſhould be cloſed: but at the ſame time another opening ſhould be made for admitting freſh air, in another more convenient part; for a circulation of air, eſpecially in rooms where a fire is kept, is not only ſalutary and uſeful, but abſolutely neceſſary.

Air, directions for the admission of. In an ingenious publication, intitled, *a Practical Treatiſe on Chimneys*, there are the following remarks relating to the moſt proper method of admitting air into a room, and of expelling the contaminated air. The author, directing to make a vent hole near the top of the room, in order to expel the heated and contaminated air, ſays, that "this might be done by means of a ſmall tube opening into the room, either in or near the cieling; which might either be carried to the top of the building, or be made to communicate with the external air, by a ſmall perforation through the wall at the roof of the room; by means of either of which, a proper circulation would be eſtabliſhed, and the foul air be carried off. For the fire would no ſooner have warmed any particles of air within the room, than theſe would be greatly expanded, and riſe immediately upwards, ſo as to fill the higher parts of the room with rarefied air; and as other particles would be ſucceſſively heated and rarefied in their turn, by their expanſive force they would preſs upon the ſides of the apartment in every place, ſo as to force the higheſt particles through the openings, left for that purpoſe in the top of the room: by which means the fouleſt air would be gradually drawn off, without deſcending again into the lower regions to the annoyance of the company." But in order to let freſh air in to the room, "Let," ſays he, "another opening be made in the cieling of the room, having communication with a ſmall pipe, that ſhould lead from thence, either to the outſide of the wall of the houſe, or to any other part of the building that might be judged more convenient, where it ſhould be bent, and conducted downwards, till it reached the ground; where it ſhould be left open to communicate with the external air. In this ſituation, the cool external air would be forced in at the lower opening of the tube, and made to aſcend into the apartment, in proportion to the quantity that eſcaped towards the higher regions, by means of the ventilator. And as that weighty air would no ſooner enter the room, than it would tend towards the floor by its own natural gravity, it would gradually mix with the heated air in its deſcent, become, in ſome meaſure, warmed by that means, and equally diſperſed through the room, ſo as ſlowly and imperceptibly to reach the candles and the company in the room, and ſupply them with a ſufficient quantity of freſh and wholeſome

ſome air, without the inconveniences to which the company are ſubjected, by the uſual way of admitting freſh air." Such readers as have been little accuſtomed to ſpeculations of this ſort, will be at a loſs to comprehend in what manner two holes, both of them in the roof of the room, and communicating with the air, without any valve, or other contrivance, for opening or cloſing of themſelves, ſhould yet anſwer the two very oppoſite purpoſes, the one, of conſtantly bringing cool air into the room without emitting any warm air, and the other, of as conſtantly emitting warm and admitting no cold air. They will advert, that the one of theſe tubes communicates with the atmoſphere, at the bottom of the houſe, and the other towards the top: the opening of the one is beneath the level of the room, that of the other above it.

Now, as the air is more denſe at the ſurface of the ground, than at the height above it, the warm rareſying air will naturally iſſue at the opening where it meets with leaſt reſiſtance, which muſt invariably be through that which opens to the external air at the greateſt height; and as the cool air will naturally be preſſed into the room, by that opening where the air is moſt weighty, this muſt invariably be by that which is neareſt the ſurface of the earth. When it thus enters near the floor of the apartment, it is hurried along, in a rapid undivided ſtream, towards the fire place, and ſtriking upon the legs and inferior parts of the body, affects them with a ſtrong ſenſation of cold. To overcome the effects of this, large fires muſt be kept; by which other parts of the body are warmed to an extraordinary degree, which is productive of moſt of thoſe diſorders that are pernicious to the young, and often prove fatal to the old, during the winter ſeaſon, in cold regions. "Thus," adds this ingenious author, "might our apartments be kept conſtantly, moderately, and equally warm, at a ſmall expence, without endangering our health on the one hand, by reſpiring a confined, ſtagnant, and putrid air; or, on the other hand, by ſubjecting ourſelves to ſuch danger of catching colds, conſumptions, and rheumatic complaints, by being expoſed to ſuch exceedingly unequal degrees of heat and cold, as are unavoidable where our apartments are ſo open as to admit a ready paſſage to the external air during the winter ſeaſon. The reader will eaſily perceive, that all that has been ſaid has a reference only to thoſe apartments in cold climates, and rigorous weather, where fire to warm them becomes neceſſary. In warm regions, or during ſummer, there can be no objection to the wheel ventilator in the window. It is a ſimple contrivance, and a ſafe and effectual mean of preſerving the air in our apartments ſweet and wholeſome at that ſeaſon."

Air, effects of fire upon. It is a vulgar error among many people, to believe that fire purifies the contaminated air, by deſtroying the noxious particles mixed with it; and for this reaſon they think, that the fire kept in a room where the air is tainted, purifies the room, by rendering the air in it again fit for reſpiration. Indeed, a fire kept in a room or apartment where the air is tainted, as is the caſe with hoſpitals, goals, and the like, does certainly purify the apartment, and the practice is very uſeful; but this effect is only becauſe the fire promotes the circulation of the air, and dries the dampneſs of rooms, furniture, &c. ſo that it is not the infected air that is purified, but it is new, freſh, and wholeſome air, that by the action of the fire, has taken the place of the infected air; which infected air, being rarefied by the heat, has been expelled from the apartment. Fire and combuſtion in general are ſo far from purifying contaminated air, that they actually contaminate a prodigious quantity of it in a ſhort time; ſo that not only a common fire, but even a lighted candle, when kept in a well cloſed room, wherein the external air has not a free acceſs, inſtead of purifying, renders the air of that room noxious.

Air, or Ayrshire, in geography, an extenſive county of Scotland, which reaches 90 miles in length, and generally from 20 to 25 miles in breadth. It is bounded on the N. by Renfrew, on the S. by Galloway, on the E. by Lanarkſhire, and on the W. by the Firth of Clyde. It comprehends the diſtricts of Carrick, Coil and Cuninghame, which are divided into 46 pariſhes, and contain 662,005 Engliſh acres. According to an authentic account of this county, drawn up in 1791, it appears, that during the forty preceding years, it had rapidly improved in cultivation, trade and commerce, as well as in the population, induſtry and opulence of its inhabitants. It then contained 83,892 ſouls, and had gained an increaſe within that period, of 14,883 individuals. This county exhibits the form of two wings extending to the N. W. and S. W. forming a vaſt bay at the mouth of the Firth of Clyde. The principal rivers in it are the Ayr, the Stancher, the Girvan, the Doon, and the Irwin. The roads are excellent, and the plantations and clumps of trees numerous and beautiful. The county abounds in coals, iron and other minerals.

Air, or Ayr, the capital of Ayrſhire, is ſituated on a ſandy plain, and built on both ſides of a river of the ſame name. It is ſituated 75 miles from Edinburgh, and carries on a conſiderable trade in coals and grain, for which it may be reckoned the market town to the adjacent coaſt. It had formerly a fiſhery and a conſiderable foreign trade, which are now on the decline, although in other reſpects, it is flouriſhing, particularly in the iron and cotton manufactures, tambour works, &c. This town is very ancient, and was a place of conſiderable conſequence at the time of the Norman conqueſt. It ſtill exhibits ſome valuable relics of antiquity; particularly the market croſs, which bares date to have been built in 1055; and an ancient ſtructure in ruins of a houſe of the Dominician Friar, founded by Alexander II. in 1230.

Air balloon, a general name given to bags of any light ſubſtance filled with inflammable or rarefied air, or any perminently elaſtic fluid, whoſe ſpecific gravity is conſiderably leſs than that of common atmoſpheric air. The conſequence of their being filled in this manner is, that if they are of any conſiderable magnitude, they aſcend in the air to an amazing height; and will not only aſcend by themſelves, but cary up along with them great weights, and continue to riſe, till they attain a height, in which the circumambient air is of the ſame ſpecific gravity with themſelves. See Aerostation.

AIR-BLADDER, *n. s.* [from *air* and *bladder.*] 1. Any cuticle or veſſel filled with air.—2. The bladder in fiſhes, by the contraction and dilatation of which, they vary the proportion of their weight to that of their bulk, and riſe or fall. See Comparative Anatomy, and Ichthyology.

AIRBUILT, *adj.* built in the air, without any ſolid foundation.

AIR-DRAWN, *adj.* [from *air* and *drawn.*] drawn or painted in air: a word not uſed.

AIRER, *n. s.* [from *To air.*] he who expoſes to the air.

AIR-GUN, a pneumatic machine for exploding bullets, &c. The common air gun is made of braſs, and has two barrels; the inſide barrel A, Plate II. Fig. 10, which is of a ſmall bore, from whence the bullets are exploded; and a large barrel ECDR on the outſide of it, There is a ſyringe SMP fixed in the ſtock of the gun, by which the air is injected into the cavity between the two barrels thro' the valve EP. The ball K is put down into its place in the ſmall barrel, with the rammer, as in any other gun. At SL is another valve, which, being opened by the trigger O, permits the air to come behind the bullet, ſo as to drive it forwards. If this valve be opened and ſhut ſuddenly, one charge of condenſed air may be ſufficient for ſeveral diſcharges of bullets; but if the whole air be diſcharged on one ſingle bullet, it will drive it out with a greater force. This diſcharge is effected by means of a lock Fig. 13. placed as in other guns; for the trigger being pulled, the cock will go down and drive the lever O, Fig. 10, which will open the valve, and let in the air upon the bullet K. Air guns, of late, have been much improved in their conſtruction. Fig. 11. repreſents one made by the late Mr. B. Martin, which, for ſimplicity and perfection, exceeds all others. A is the barrel, with the lock, ſtock, ram-rod, &c. of the ſize and weight of a common fowling piece. Under the lock at *b*, is a round ſteel tube, having a ſmall moveable pin in the inſide, which is puſhed out when the trigger *a* is pulled, by the ſpring work within the lock; to this tube *b*, a hollow copper ball *c* ſcrews, perfectly air-tight. This copper ball is fully charged with condenſed air by the ſyringe B, Fig. 9. previous to its being applied to the tube *b* of Fig. 11. It is then evident, that if a bullet be rammed down in the barrel, the copper ball ſcrewed faſt at *b*, and the trigger *a* be pulled, that the pin in *b* will, by the action of the ſpring work within the lock, forcibly ſtrike out into the copper ball, and thereby puſhing in ſuddenly a valve within the copper ball, let out a portion of the condenſed air; which air will ruſh up through the aperture of the locks, and forcibly act againſt the bullet, driving it to the diſtance of 60 or 70 yards, or further. If the air is ſtrongly condenſed, at every diſcharge only a portion of the air eſcapes from the ball; therefore by re-cocking the piece, another diſcharge may be made; and thus repeated to the amount of 15 or 16 times. An additional barrel is ſometimes made, and applied for the diſcharge of ſhot, inſtead of the one deſcribed. The air in the copper ball is condenſed by means of the ſyringe B, Fig. 9. in the following manner. The ball *c* is ſcrewed quite cloſe on the top of the ſyringe. At the end of the ſteel-pointed rod *a*, is a ſtout ring, through which paſſes the rod *k*: upon this rod the feet ſhould be firmly ſet; then the hands are to be applied to the two handles *ii*, fixed on the ſide of the barrel of the ſyringe. Now by moving the barrel B ſteadily up and down on the road *a*, the ball *c*, will become charged with condenſed air; and it may be eaſily known when the ball is as full as poſſible, by the irreſiſtable action that the air makes againſt the piſton when you are working the ſyringe. At the end of the rod *k*, is uſually a four-ſquare hole, which with the rod ſerves as a key to faſten the ball *c* on the ſcrew *b* of the gun and ſyringe, cloſe to the orifice in the ball *c*. In the inſide is fixed a valve and ſpring, which gives way for the admiſſion of air; but upon its emiſſion comes cloſe up to the orifice, ſhutting up the internal air. The piſton rod works air-tight, by a collar of leather on it, in the barrel B; it is therefore plain, when the barrel is drawn down, the air will ruſh in at the hole *b*. When the barrel is puſhed down, the air therein contained will have no other way to paſs from the preſſure of the piſton, but into the ball *c* at top. The barrel being drawn up, the operation is repeated, until the condenſation is ſo ſtrong as to reſiſt the action of the piſton. Sometimes the ſyringe is applied to the end of the barrel C, (ſee Fig. 12,) the lock and trigger ſhut up in a braſs caſe *d*; and the triger pulled, or diſcharge made, by pulling the chain *b*. In this contrivance there is a round chamber for the condenſed air at the end of the ſyringe at *e*, and it has a valve acting in a ſimilar manner to that of the copper ball. When this inſtrument is not in uſe, the braſs caſe *d* is made to ſlide off, and the inſtrument then becomes a walking *ſtick*; from which circumſtance, and the barrel being made of cane, braſs, &c. it has received the appellation of *Air Cane*. The head of the cane unſcrews and takes off at *a*, where the extremity of the piſton rod in the barrel is ſhown: an iron rod is placed in a ring at the end of this, and the air condenſed in the barrel in a ſimilar manner to that of the gun as above; but its force of action is not near ſo ſtrong and permanent as that of the latter.

Air-gun, the Magazine, was invented by that ingenious artiſt L. Colbe. By this contrivance ten bullets are ſo lodged in a cavity, near the place of diſcharge, that they may be drawn into the ſhooting barrel, and ſucceſſively diſcharged ſo faſt, as to be nearly of the ſame uſe as ſo many different guns.

AIRHOLE, *n, s.* a hole to admit the air.

AIR-JACKET, a ſort of jacket made of leather, in which are ſeveral bags, or bladders, compoſed of the ſame materials, communicating with each other. Theſe are filled with air through a leather tube, having a braſs ſtop-cock accurately ground at the extremity, by which means the air blown in through the tube is confined to the bladders. The jacket muſt be wet, before the air be blown into the bags, as otherwiſe it will immediately eſcape through the pores of the leather. By the help of theſe bladders, which are placed near the breaſt, the perſon is ſupported in the water, without making any effort to ſwim.

AIRNESS, *n. s.* 1. Openneſs; expoſure to the air.—2. Lightneſs; gaiety; levity.

AIRING, *n. s.* a ſhort journey to enjoy the freſh air.

AIRLESS, *adj.* wanting communication with the air.

AIRLING, *n. s.* a young, light, thoughtleſs, gay perſon.

AIR pipes, an invention for drawing foul air out ſhips, or any other cloſe places, by means of fire. T pipes were firſt found out by one Mr. Sutton, a brev London; and from him have got the name of *Sutton's Pipes*. The principle on which their operation depe known to every body, being indeed no other than that neceſſary for the ſupport of fire; and, if it has no ac from the places moſt adjacent, will not fail to c thoſe that are moſt remote. Thus, in a common the air enters through the aſh-hole; but if this be cloſe and a hole made in the ſide of a furnace, the air will with great violence through that hole. If a tube of any length whatever is inſerted in this hole, the air will ruſh through the tube into the fire, and of conſequence there will be a continued circulation of air in that place where the extremety of the tube is laid. Mr. Sutton's contrivance then, as communicated to the Royal Society by Dr. Mead, amounts to no more than this.—"As, in every ſhip of any bulk, there is already provided a copper or boiling-place proportionable to the ſize of the veſſel, it is propoſed to clear the bad air, by means of the fire already uſed under the ſaid coppers or boiling-places for the neceſſary uſes of the ſhip. It is well known, that, under every ſuch copper or boiler, there are placed two holes, ſeparated by a grate; the firſt of which is for the fire, and the other for the aſhes falling from the ſame; and that there is alſo a flue from the fire-place upward, by which the ſmoke of the fire is diſcharged at ſome convenient place of the ſhip. It is alſo well known, that the fire once lighted in theſe fire-places, is only preſerved by the conſtant draught of air through the forementioned two holes and flue; and that if the ſaid two holes are cloſely ſtopped up, the fire, though burning ever ſo briſkly before, is immediately put out. But if, after ſhutting up the abovementioned holes, another hole be opened, communicating with any other room or airy place, and with the fire; it is clear, the ſaid fire muſt again be raiſed and burn as before, there being a like draught of air through the ſame as there was before the ſtopping up of the firſt holes; this caſe differing only from the former in this, that the air feeding the fire will now be ſupplied from another place. It is therefore propoſed, that in order to clear the holds of ſhips of the bad air therein contained, the two holes abovementioned, the fire-place and aſh-place, be both cloſed up with ſubſtantial and tight iron doors: and that a copper or leaden pipe, of ſufficient ſize, be laid from the hold into the aſh-place, for the draught of air to come in that way to feed the fire. And thus it ſeems plain, from what has been already ſaid, that there will be, from the hold, a conſtant diſcharge of the air therein contained; and conſequently, that that air ſo diſcharged, muſt be as conſtantly ſupplied by freſh air down the hatches or ſuch other communications as are opened into the hold; whereby the ſame muſt be continually freſhened, and its air rendered more wholeſome and fit for reſpiration. And if into this principal pipe ſo laid into the hold, other pipes are let in, communicating reſpectively either with the well or lower decks; it muſt follow, that part of the air, conſumed in feeding the fire, muſt be reſpectively drawn out of all ſuch places to which the communication ſhall be ſo made."—This account is ſo plain that no doubt can remain concerning the efficacy of the contrivance; it is evident, that, by means of pipes of this kind, a conſtant circulation of freſh air would be occaſioned through thoſe places where it would otherwiſe be moſt apt to ſtagnate and putrefy. Several other contrivances have been uſed for the ſame purpoſe; and Dr. Hale's ventilators, by ſome unaccountable prejudice have been reckoned ſuperior in efficacy, and even ſimplicity, to Mr. Sutton's machine, which at its firſt invention met with great oppoſition, and even when introduced by Dr. Mead, who uſed all his intereſt for that purpoſe, was ſhamefully neglected.

Air Pipes, attempts to improve. A machine capable of anſwering the ſame purpoſe was invented by Mr. Deſaguliers, which he called the *Ships lungs*. It conſiſted of a cylindrical box ſet up on its edge, and fixed to a wooden pedeſtal. From the upper edge of the box iſſued a ſquare trunk open at the end, and communicating with the cavity of the box. Within this box was placed a cylindrical wheel turning on an axis. It was divided into 12 parts, by means of partitions placed like the radii of a circle. Theſe partitions did not extend quite to the centre, but left an open ſpace of about 18 inches diameter in the middle; towards the circumference, they extended as far as poſſible without interfering with the caſe, ſo that the wheel might always be allowed to turn freely.—Things being thus circumſtanced, it is plain that if the wheel was turned towards that ſide of the box on which the trunk was, every diviſion would puſh the air before it, and drive it out, throught the trunk, at the ſame time that freſh air would come in through the open ſpace at the centre, to ſupply that which was thrown out through the trunk. By turning the wheel ſwiftly, a ſtrong blaſt of air would be continually forced out through the ſquare trunk, on the ſame principles on which a common fanner winnows corn. If the wheel is turned the oppoſite way, a draught of air may be produced from the trunk to the centre. If this machine, then, is placed in a room where a circulation air is wanted, and the trunk made to paſs through one of the walls; by turning the wheel ſwiftly round, the air will be forced with great velocity out of that room, at the ſame time that freſh air will enter, through any chinks by which it can have acceſs, to ſupply that which has been forced out. It is evident, that the circulation which is promoted by this machine, is entirely of the ſame kind with that produced by Mr. Sutton's; the turning of the wheel in Mr. Deſagulier's machine, being equivalent to the rarefaction of the air by fire in Mr. Sutton's: but that the latter is vaſtly ſuperior, as acting of itſelf, and without intermiſſion, requires no arguments to prove. Mr. Sutton's machine has yet another conveniency, of which no other contrivance for the ſame purpoſe can boaſt; namely, that it not only draws out putrid air, but deſtroys it by cauſing it to paſs through fire; and experience has abundantly ſhown, that though putrid air is thrown into a great quantity of freſh air, it is ſo far from loſing its pernicious properties, that it often produces noxious diſeaſes. We do not ſay, indeed, that putrid air becomes ſalutary by this means; but it is undoubtedly rendered leſs noxious than before; though, whether it is equally innocent with the ſmoke of fire fed in the common way, we cannot pretend to determine. Beſides this machine by Mr. Deſaguliers, the ventilators of Dr. Hales, already mentioned, and thoſe called *wind-sails*, are likewiſe uſed for the ſame purpoſe. The former of which is an improvement of the Heſſian bellows (See Ventilator): the other is a contrivance for throwing freſh air into thoſe places where putrid air is apt to lodge; but this has the laſt mentioned inconvenience in a much greater than any of the others, as the blaſt of freſh air throws out that which was rendered putrid by ſtagnation, in ſuch manner as to contaminate all around it. See Wind Sails.

AIR-PUMP, a machine by which the air contained in a proper veſſel may be exhauſted or drawn out. For a copious deſcription of this uſeful machine, see the Syſtem of Pneumatics, wherein is alſo deſcribed Prince's American

Air-Pump, which is alſo ſuperior to Smeaton's, and every other conſtruction of the kind.

Air Sacs, in birds. See Comparative Anatomy.

Air Shafts, among miners, denote holes or ſhafts let down from the open air to meet the adits, and furniſh freſh air. The damps, want, and impurity of air which occur, when adits are wrought 30 or 40 fathoms long, make it neceſſary to let down air ſhafts, in order to give the air liberty to play through the whole work, and thus diſcharge bad vapours, and furniſh good air for reſpiration: the expence of which ſhafts, in regard of their vaſt depths, hardneſs of the rocks, drawing of water, &c. ſometimes equals, nay exceeds, the ordinary charge of the whole adit. Sir Rubert Murray deſcribes a method, uſed in the coal mines at Liege, of working mines without air-ſhafts. When the miners at Mendip have ſunk a groove, they will not be at the charge of an air-ſhaft till they come at ore; and for the ſupply of air have boxes of elm exactly cloſed, of about ſix inches in the clear, by which they carry it down about 20 fathoms. They cut a trench at a little diſtance from the top of the groove, covering it with turf and rods diſpoſed to receive the pipe, which they conceive to come in ſideways to their groove, four feet from the top; which carries dowe the air to a great depth. When they come at ore, and need an air-ſhaft, they ſink it four or five fathoms diſtant, according to the convenience of the breadth, and of the ſame faſhion with the groove, to draw as well ore as air.

Air threads, in natural hiſtory, a name given to the long filaments, ſo frequently ſeen in autumn floating about in the air. Theſe threads are the work of ſpiders, eſpecially of that ſpecies called the long legged field ſpider; which, having mounted to the ſummit of a buſh or tree, darts from its tail, ſeveral of theſe threads, till one is produced capable of ſupporting the creature in the air: on this it mounts in queſt of prey, and frequently riſes to a very conſiderable height. See Arania.

Air trunk, is a contrivance by Dr. Hales to prevent the ſtagnation of putrid effluvia in jails, and other places where a great number of people are crowded together, in a ſmall place. It conſiſts only of a long ſquare trunk, open at both ends; one of which is inſerted into the ceiling of the room, the air of which is required to be kept pure; and the other extends a good way beyond the roof. Through this trunk a continued circulation is carried on: and the reaſon is, that the putrid effluvia, which do ſo much miſchief when collected, being much lighter than the pure atmoſphere, ariſe to the top of the room; and, if they there find a vent, will continually go out through it. Theſe effluvia ariſe in very conſiderable quantity, being calculated by the late Dr. Keil, at no leſs than 39 ounces from one man in 24 hours. Theſe trunks were firſt made trial of by Mr. Yeoman, over the Britiſh Houſe of Commons, where they were nine inches wide within; and over the Court of King's Bench in Weſtminſter hall, where they were ſix inches wide. They are ſometimes made wider, and ſometimes narrower: but the wider they are, the longer they ought to be, more effectually to prevent the aſcent of the vapour. The reaſon why vapours of this kind aſcend more ſwiftly through a long trunk than a ſhort one, is, that the preſſure of fluids is always according to the different depth, without regard to the diameter of their baſis, or of the veſſel which contains them; and, upon this principle, a gallon of water may be made to ſplit a ſtrong caſk. See Hydrostatics. When the column of putrid effluvia is long and narrow, the difference between the column of atmoſphere preſſing upon the upper end, is much greater than if the column of putrid effluvia was ſhort and wide; and conſequently the aſcent is much ſwifter. One pan of a ſingle pair of ſcales, which was two inches in diameter, being held within one of theſe trunks over the Houſe of Commons, the force of the aſcending air made it riſe ſo as to require four grains to reſtore the equilibrium, and this when there was no perſon in the houſe; but when it was full, no leſs than 12 grains were requiſite to reſtore the equilibrium; which clearly ſhows that theſe trunks muſt be of real and very great efficacy.

Air Vessels, are ſpiral ducts in the leaves, &c. of plants ſuppoſed to be analagous to the lungs of animals, in ſupplying the different parts of a plant with air. See Plants.

AIRY *adj.* 1. Compoſed of air.—2. Relating to the air; belonging to the air.—3. High in air.—4. Open to the free air.—5. Light as air; thin; unſubſtantial; without ſolidity.—6. Wanting reality; having no ſteady foundation in truth or nature; vain; trifling.—7. Fluttering; looſe; as if to catch the air; full of levity.—8. Gay; ſprightly; full of mirth; lively.

Airy, or Aery, among ſportſmen, a term expreſſing the neſt of a hawk or eagle.

Airy triplicity, among aſtrologers, denotes the three ſigns, gemini, libra, and aquarius.

AISLE, *n. s.* the walks in a church, or wings of a quire.

AISNE, a department in France, ſo called from a river of the ſame name, which riſes in Champaigne, and runs W. by Soiſſons in the iſle of France, falling into the river Oiſe, above Compiegne.

AJUGA, Bugle, a genus of the gymnoſpermia order, belonging to the didynamia claſs of plants, and in the natural method ranked under the 42d order, Aſperifoliæ. The characters are: the calyx is a ſhort perianthium monophyllous and perſiſtent: the corrola is monopetalous and grinning: the ſtamina conſiſts of four erect ſubulated filaments; the antheræ are dimidiated: the piſtillum has a four-cleft germen, a filiform ſtylus, and two ſlender ſtigmata; there is no pericarpium; the calyx converging, and containing the ſeeds in its boſom: the ſeeds are four, and oblong. There are four ſpecies enumerated by Linnæus, viz.

1. Ajuga genevensis, with woolly leaves and hairy cups, is a native of Switzerland, and of the ſouthern parts of Europe. This ſpecies is propagated by ſide ſhoots, and ſucceeds beſt in a moiſt ſhady ſituation.

2. Ajuga orientalis, with inverted flowers, is a native of the eaſt. It is propagated by ſowing the ſeeds ſoon after they are ripe, in a pot filled with loomy earth, and placed in a ſhady ſituation till autumn; when it muſt be removed under a frame, and protected from the froſts. In ſpring after the plants are come up, let them be tranſlated each into a ſeparate pot, and in the ſummer placed under a ſhady ſituation.

3. Ajuga pyramidalis, or mountain bugle, with a ſquare pyramidal ſpike and blue flowers, is a native of Sweden, Germany, Switzerland, and the hilly parts of Britain.

Sheep and goats eat it; cows are not fond of it; horſes and ſwine refuſe it.

4. **Ajuga reptans**, common or paſture bugle, with creeping ſuckers, and blue, red, or white bloſſoms, in long leafy ſpikes, is a native of the ſouthern parts of Europe, and is met with in woods and moſt places in many parts of Britain. The roots are aſtringent, and ſtrike a black colour with vitriol of iron. Theſe two laſt ſpecies are propagated like the firſt.

AJURA-catinga, in ornithology, the name of a Braſilian parrot. It is of the ſize of a pullet, and all over of a very fine bright green; its eyes are red, and the ſkimmy circle about them is white; its beak and legs are alſo white.

Ajura-curau, in ornithology, the name of a Braſilian parrot, of the ſize and ſhape of the common green parrot, of which there are two varieties. The firſt an externally beautiful one with a blue crown; the throat and ſides of the head are of a fine yellow, and all the reſt of the body of a cheerful green; the long winged feathers are half black, and half of a fine ſtrong yellow, and at their ends variegated with blue and green; and the tail edged with red, black and blue. The other kind has the ſame colours differently diſpoſed; its head is yellow, with a whitiſh caſt; the throat and ſides of the head about the eyes are of a clearer yellow; and there is a ſea-green ſpot near the head. Beſides theſe, there is alſo another variety, the ſpecies of which have all the colours of the firſt kind, but have an admixture of black about the head, a yellow ſpot on the crown, another of the ſame colour below the eyes, and a blue one under the throat.

Ajura para, in ornithology, the name of a Braſilian ſpecies of parrot of a ſmall ſize; all over of a beautiful green, and with white legs, a white beak, and white ſkinny circles round its eyes.

AJUTAGE, *n. ſ.* an additional pipe to water works.

Ajutage, or **Adjutage**, in *Hydraulics*, part of the apparatus of an artificial fountain, or *jet d'eau*; being a ſort of tube, fitted to the mouth, or aperture of the veſſel, thro' which the water is to be played, and by it determined into this, or that figure. It is chiefly the diverſity in the ajutages, that makes the different kinds of fountains.—And hence, by having ſeveral ajutages to be ſupplied occaſionally, one fountain comes to have the effect of many. Marriotte enquires into the beſt kind of ajutages, or ſpouts, for *jets d'eau*, affirming from experiment, that an even poliſhed round hole, in the end of the pipe, gives a higher jet than either a cylindric, or a conical ajutage. See Fountain and Hydrostatics.

AIX, a handſome and ancient city of France, in the department of the Mouths of the Rhone, the capital of the ci-devant province called Provence, ſituated 17 miles E. from Montpelier. It is a well built city, and reſembles Paris more than any other in the republic. Excellent wine is produced in its neighbourhood, but its trade is in oil; which is uncommonly fine; and there are alſo ſome ſtuffs manufactured in it. The city is populous, and is ſeated in a large plain, chiefly planted with olive trees, and is embelliſhed with abundance of fine fountains, and ſeveral beautiful ſquares. The town hall is at one end of the city, and is diſtributed into ſeveral fine apartments. The cathedral church is a Gothic ſtructure, and contains ſeveral ancient monuments. The Corſe, or Orbitelle, is a magnificent walk, above 300 yards long, formed by a triple avenue of elms, and two rows of regular and ſtately houſes. The churches in general are handſome buildings, and before the revolution, at leaſt, (if they are not ſo ſtill,) were ornamented with a great number of elegant paintings, beſides many other curioſities. In one of them, there was a ſilver ſtatue of the Virgin Mary, almoſt as large as life, which in all probability has undergone the fate of ſimilar antiquities, and been melted and turned into money by the republicans. The baths without the city, which were diſcovered not long ſince, have good buildings, raiſed at a vaſt expence, for the accommodation of thoſe who drink the waters; but it is now chiefly reſorted to on account of its warm ſprings, which are ſuppoſed to poſſeſs particular virtues in caſes of debility. Long. 80. 31. E. Lat. 43. 32. N.

Aix, an ancient town of France, in the department of Mont Blanc, in the ci-devant duchy of Savoy, 8 miles N. of Chamberry. It is ſeated on the lake Bourget, at the foot of a mountain, between Chamberry, Amecy, and Rumilly. There is here a triumphal arch of the ancient Romans, but it is almoſt entirely ruined. The mineral waters bring a great number of ſtrangers to this place. Long. 81. 10. E. Lat. 45. 40. N.

Aix-la-chapelle, a large and handſome city of Germany, in the circle of Weſtphalia and duchy of Juliers. It has a caſtle, built upon a hill, from which may be ſeen 60 different towns, in a clear day. The town is ſeated in the valley, and is ſurrounded with woods and mountains, notwithſtanding which it is very healthy. It is a free imperial town, and all authors agree about its antiquity, it being mentioned in Cæſar's Commentaries and the Annals of Tacitus. The Romans called it Aquægranii, that is, the waters of Granius. Its preſent name, *Aix la-Chapelle*, was given it by the French, on account of a chapel built in honour of the Virgin Mary, by Charlemagne; who having repaired, beautified, and enlarged the city, which had been deſtroyed by the Huns in 451, made it the uſual place of his reſidence. The town may be divided into the inward and outward city. The inward is encompaſſed with a wall about three quarters of a league in circumference, having 10 gates; and the outward wall, in which there are 11 gates, is about a league and a half in circumference. There are rivulets which run through the town and keep it very clean. They have ſtone quarries in the neighbourhood, which furniſh the inhabitants with proper materials for their magnificent buildings, of which the ſtadt-houſe, and the cathedral are the chief. There are likewiſe 30 parochial churches. This place is famous for ſeveral councils and treaties of peace concluded here; particularly thoſe between France and Spain in 1668, and between Great-Britain and France in 1748. Long. 81. 3. E. Lat. 50. 48. N.

Aix-la-chapelle, mineral waters. The hot ſulphureous waters, for which this place has ſo long been celebrated, ariſe from ſeveral ſources, which ſupply eight baths conſtructed in different parts of the town. Theſe waters near the ſources are clear and pellucid; and have a ſtrong ſulphureous ſmell reſembling the waſhing of a foul gun; but they loſe this ſmell by expoſure to air. Their taſte is ſaline, bitter, and urinous. They do not contain iron. They are alſo neutral near the fountain, but afterwards are manifeſtly and pretty ſtrongly alkaline, inſomuch that clothes are waſhed with them without ſoap.—On the vaults above the ſprings and aqueducts of theſe waters is found, every year, when they are opened, a quantity of fine white-coloured flowers of ſulphur, which has been ſublimed from the waters. The heat of the water of the hotteſt ſpring, by Dr. Lucas's account, raiſes the quickſilver of Fahrenheit's thermometer to 136—by Monſ. Monet's account, to 146—and the heat of the fountain, where they commonly drink, by Dr. Lucas's account, to 112. Dr. Simmons has given the following account of their ſeveral temperatures, as repeatedly obſerved by himſelf.

The ſpring which ſupplies the Emperor's Bath, the New Bath, and the Queen of Hungary's Bath.	127°
St. Quirin's Bath. - - - - - - -	112°
The Roſe Bath, and the Poor's Bath, both ſupplied by the ſame ſpring. - - - - - -	112°
Charles's Bath, and St. Corneille's Bath. - -	112°
The ſpring uſed for drinking is in the High-Street, oppoſite to Charles's Bath; the heat of it at the pump is - - - - - - - - - -	106°

Dr. Lucas evaporated the water of the hotteſt ſpring, the Emperor's Bath, and obtained 268 grains of ſolid matter from a gallon, compoſed of 15 grains of calcareous earth, 10 grains of ſelenites, and 243 grains of a ſaline matter made up of natron and ſea-ſalt. They are at firſt nauſeous and harſh, but by habit become familiar and agreeable. At firſt drinking alſo, they generally affect the head. Their general operation is by ſtool and urine, without griping or diminution of ſtrength; and they alſo promote perſpiration.

Aix-la-chapelle waters, *rules for drinking*, the quantity to be drank, as an alterative, is to be varied according to the conſtitution and other circumſtances of the patient. In general, it is beſt to begin with a quarter or half a pint in the morning, and increaſe the doſe afterwards to pints, as may be found convenient. The water is beſt drank at the fountain. When it is required to purge, it ſhould be drank in large and often repeated draughts. In regard to bathing, this alſo muſt be determined by the age, ſex, ſtrength, &c. of the patient, and by the ſeaſon. The degree of heat of the bath ſhould likewiſe be conſidered. The tepid ones are in general the beſt, though there are ſome caſes in which the hotter ones are moſt proper. But even in theſe, it is beſt to begin with the temperate baths, and increaſe the heat gradually. Theſe waters are efficacious in diſeaſes proceeding from indigeſtion and from foulneſs of the ſtomach and bowels. In rheumatiſms, in the ſcurvy, ſcrophula, and diſeaſes of the ſkin; in hyſteric and hyp chondrical diſorders; in nervous complaints and melancholy; in the ſtone and gravel; in paralytic complaints; in theſe evils which follow an injudicious uſe of mercury; and in many other caſes. They ought not, however, to be given in hectic caſes where there is heat and fever, in putrid diſorders, or where the blood is diſſolved, or the conſtitution much broken down. The time of drinking, in the firſt ſeaſon, is from the beginning of May to the middle of June; and in the latter ſeaſon, from the middle of Auguſt to the latter end of September.

To AKE, *v. n.* [more grammatically written *ache.*] to feel a laſting pain.

AKIN, *adj.* 1. related to; allied by blood.—2. partaking of the ſame properties.

AKISSAT, the ancient Thyatira, a city in Natolia, in Aſia, ſituated in a plain 18 miles broad, which produces plenty of cotton and grain. The inhabitants, who are reckoned to be about 5000, are ſaid to be all Mahometans, The houſes are built of earth or turf, and are very low and ill contrived: but there are ſix or ſeven moſques, which are all of marble. There are remarkable inſcriptions on marble in ſeveral parts of the town, which are part of the ruins of ancient Thyatira. It is ſeated on the river Hermus, 50 miles from Pergamos. Lon. 105, 30, E. Lat. 38, 48, N.

AL, an Arabic particle prefixed to words, and ſignifying much the ſame with the Engliſh particle *the:* Thus they ſay, alkermes, alkoran, &c. i. e. the kermes, the koran, &c.

Al, or Ald, a Saxon term frequently prefixed to the names of places denoting their antiquitiy; as Aldborough, Aldgate, &c.

ALA, in botany, is uſed for the hollow of a ſtalk, which either the leaf, or the pedicle of the leaf, makes with it; or it is that hollow turning, or ſinus, placed betwen the ſtalk or branch of a plant and the leaf, whence a new offſpring uſually iſſues. Sometimes it is uſed for thoſe parts of leaves otherwiſe called *lobes* or *wings*. See Alæ.

ALABAHAS, a conſiderable river in Eaſt Florida. It is alſo ſaid to be the name of a branch of St. Mary's river, which forms a part of the ſouthern boundary line of the United States.

ALABAMA, an Indian village, delightfully ſituated on the banks of the river Miſſiſſippi. Theſe Indians are the remains of the ancient Alabama nations who inhabited the eaſt arm of the *Great Mobile River*, which ſtill bears their name, but is now poſſeſſed by the Creeks or Meſcogulges, who conquered the former.

Alabama, river, is formed by the junction of the *Coosa*, *Coosee*, or *High Town* river, and the *Tallapooſe* river, at Little Talaſſe, a town of the Upper Creeks, in the Georgia Weſtern Territory, and runs in a ſouth weſt direction, until it meets the river Tombigbee from the north weſt, at the great iſland, which it there forms 90 miles from the mouth of Mobile bay, in the Gulph of Mexico. This beautiful river has a gentle current, pure water, and remarkable fine fiſh. It runs about 2 miles an hour, is about 70 rods wide at its head, and from 16 to 18 feet deep in the dryeſt ſeaſon. Its banks abound with valuable productions in the vegetable and mineral kingdoms. From Little Talaſſee to Mobile bay, which is about 350 miles by water, travellers have gone down in large boats in the month of May, in nine days.

ALABASTER, *adj.* made of Alabaſter.

Alabaster, *n. s.* a kind of ſoft marble, eaſier to cut and leſs durable, than the other kinds; ſome is white, which is moſt common; ſome of the colour of horn, and tranſparent; ſome yellow, like honey, marked with veins. The ancients uſed it to make boxes for perfumes.

Alabaster, in antiquity, a term, uſed for a vaſe, wherein odoriferous liquors were anciently put. The reaſon of the denomination is, that veſſels for this purpoſe were frequently made of the alabaſter ſtone, (ſee next article) which Pliny and other ancients repreſent as peculiarly proper for this purpoſe. Alabaſter alſo is ſaid to have been uſed for an ancient liquid meaſure, containing ten ounces of wine, or nine of oil. In this ſenſe, the alabaſter was equal to half he ſextary.

Alabaster in natural hiſtory, a ſpecies of that genus of ſtones whoſe baſe is calcareous earth. It differs from marble in being combined, not with aerial, but with vitriolic acid; therefore, when mixed with any acid, no effervеſcence appears. It is ſoluble in about 500 times its weight of water at the temperature of 60. It is fuſible alone in a long continued porcelain heat, or by the blow-pipe. Specific gravity 1. 87. Texture granular, with ſhining particles. In compoſition, and conſequently in its chemical properties, it does not differ from gypſum, ſelenite, and plaſter of Paris. Alabaſter, Mr. Boyle obſerves, being finely powdered, and thus ſet in a baſon over the fire, will, when hot aſſume the appearance of a fluid, by rolling in waves, yielding to the ſmalleſt touch, and emitting vapour; all which properties it loſes again on the departure of the heat, and diſcovers itſelf a mere incoherent powder. The fineneſs and clearneſs of this ſtone renders it in ſome meaſure tranſparent; whence it has been ſometimes employed for windows. There is a church at Florence ſtill illuminated, inſtead of panes of glaſs, by ſlabs of alabaſter near 15 feet high, each of which forms a ſingle window, through which the light is conveyed. The countries in Europe which abound moſt in alabaſter are Germany, towards Coblentz; the province of Maconnois, in the neighbourhood of Cluni in France; Italy towards Rome; where that of Montaiout is particularly remarkable, not only for its whiteneſs, but alſo for the bigneſs of its blocks, ſome of which are ſo large, that ſtatues as big as the life may be eaſily cut out of them. F. Labit, in his journey to Italy, obſerves, that there are quaries of alabaſter in the neighbourhood of the village called de la Toſſa, near Civita Vecchia: there is alſo alabaſter to be found in ſome places of Lorrain; but it is not much eſteemed. A new manufacture of baſſo relievos, from a ſingular ſpecies of factitious alabaſter, was ſome time ago eſtabliſhed by M. Latapie, at the baths of St. Philip in Tuſcany. The ſtream at theſe baths depoſites a particular kind of ſand, which, when collected and condenſed in the cavities of any body employed to oppoſe its current, acquires the nature, hardneſs, and colour of alabaſter, and aſſumes the forms of thoſe cavities in which it is thus lodged.—There are three ſpecies of alabaſter, viz. 1. The snow white shining.—2. The variegated, yellow and reddiſh.—3. The yellowish, or phengites of Pliny.

Alabaster, or **Eleuthera**, one of the Bahama, or Lucayo iſlands, on which there is a ſmall fort and garriſon. It lies on the great Bahama bank. The ſoil of this iſland is better than that of the neighbouring iſland, formerly called *Abaco*, but now more generally known by the name of New-Providence, and produces moſt of the pine-apples, which are exported from that quarter. The climate of this iſland is temperate, and the air healthy. It lies between 25 and 26 N. Lat. and from 0. to 1. 5. W. Long. See Bahama.

ALABASTRA, in plants, are thoſe little herbaceous leaves which encompaſs the bottoms of flowers, particularly the roſe. See Calx, &c. Some, with Jungius, explain *alabastra*, by the globe or roundiſh bud of the roſe juſt peeping out.

ALACHUA Savannah, a level green plain, about 15 miles over and fifty in circumference, ſituated in an Indian country of the ſame name, in Eaſt Florida, being about 70 miles weſt of St. Auguſtine, the capital of that province. Though it is encirled with high ſloping hills, covered with large foreſts and fragrant orange groves, yet upon the plain itſelf there is ſcarcely to be ſeen a tree or even a buſh of any kind. The ancient *Alacbua* town ſtood on the borders of this Savannah, but the Indians, finding the place to be very unhealthy, on account of the ſtench of fiſh and other reptiles driven aſhore in the ſummer time by the allegators, and the noxious exhalations proceeding from the marſhes, removed to Cuſcoville, a place about two miles diſtant. Though the horſes and horned cattle bred in thoſe meadows are large, ſleek and fat, yet they are ſubject to ſeveral mortal diſeaſes, from which thoſe who range in the adjacent high foreſts are totally exempt.

ALACK, *interject.* [This word ſeems only the corruption of *alas.*] Alas; an expreſſion of ſorrow.

ALACKADAY, *interject.* [This like the former, is for *alas the day.*] A word noting ſorrow and melancholy.

ALACRANES Los, a large range of ſhoals, rocks and ſands, lying on the ſouth ſide of the Gulph of Mexico, oppoſite the peninſula of Yucatan. They lie in the 23d degree of north latitude, and between the 14th and 16th of weſt longitude, to the eaſtward of Cape Antonio, and weſtward of Stone bank.

ALACRITY, *n. s.* cheerfulneſs, expreſſed by ſome outward token; ſprightlineſs; gaiety; livelineſs.

ALADULIA, a conſiderable province of Turkey, in Aſia, in that part called Natolia, between the mountains of Antitaurus, which ſeparate it from Amaſia on the north, and from Carimania on the weſt. It has the Mediterranean ſea on the ſouth, and the Euphrates, or Frat, on the eaſt, which divides it from Diarbeker. It comprehends the Leſſer Armenia of the ancients, and the eaſt part of Cilicia. It is now divided into two parts: The north comprehended between Taurns, Antitaurus, and the Euphrates, is a beglerbeglic, which bears the name of Maraſh, the capital town; and the ſouth, ſeated between mount Taurus and the Mediterranean, is united to the beglerbeglic of Aleppo. The country is rough, ragged and mountainous; yet there are good paſtures, and plenty of horſes and camels. The people are hardy and thieviſh. The capital is Malatigah.

ALÆ, in anatomy, a term applied to the lobes of the liver, the cartilages of the noſtril, and ſometimes to the armpit.

Alæ, in botany, [the plural of *Ala*,] is uſed to ſignify thoſe petals or leaves of papilionaceous flowers, placed between thoſe others which are called the *vexillum* and *carina*, and which make the top and bottom of the flowers. Inſtances of flowers of this ſtructure are ſeen in thoſe of peas and beans, in which the top leaf or petal is the vexillum, the bottam the carina, and the ſide ones the alæ. Alæ is alſo applied to thoſe extremely ſlender and membranaceous parts of ſome ſeeds, which appear as wings placed on them; and likewiſe ſignifies thoſe membranaceous expanſions running along the ſtems of ſome plants, which are therefore called *alated stalks*.

ALAINS, a moſt barbarous people of the North, who, in the 4th and 5th centuries, joined the Goths and Vandals, and overſpread a great part of the ſouth of Europe, and the north of France, carrying terror and deſolation wherever they went.

ALAIS, a town of France, in the department of Gard, ſeated on the Gardon, near a beautiful plain, at the foot of the Cevennes. It contains 10,000 inhabitants, and the annual export of raw ſilk from it, is 1,200,000 lb. A hot medicinal ſpring iſſues from the adjacent mountains, and many openings in the rocks ſhow that mines have formerly been wrought in them. A fort was built in it, in 1689. It is ſituated 37 miles N. of Montpelier, and 350 S. by E. from Paris. Long. 79. 10. E. Lat. 44. 8. N.

ALAMODE, *adv.* according to the faſhion. It is uſed likewiſe by ſhopkeepers for a kind of thin, gloſſy, black ſilk manufacture.

ALANA-TERRA, Engliſh *oker;* It is eſteemed drying and aſtringent; its principal uſe is to mix with ſalt in diſtillation, in order to keep them from melting. It is thought that this ſtone is what the ancients called the Samian ſtone.

ALAND, *adv.* at land: landed; on the dry ground.

Aland, an iſland in the Baltic ocean, at the entrance of the Gulf of Bothnia, between Sweden and Finland, ſubject to the former. It lies 75 miles E. from Stockholm, is about 30 miles long, and from 12 to 16 broad, and contains 15 villages, and about 9000 inhabitants. Long. between 92. and 94. E. Lat. between 59. and 61. N.

ALANDES, a cluſter of Swediſh iſlands, of which Aland is the principal ſituated nearly as mentioned in laſt article.

ALAPOULI, in natural hiſtory, the mame of an Eaſt-Indian tree, a ſpecies of the *bilimbi*, which is uſed in medicine as a purge and vomit, mixed with the ſeeds of muſtard.

ALAQUECA, a medicinal ſtone brought from the Indies, in ſmall gloſſy fragments; much praiſed by ſome for its efficacy in hæmorhages, when applied externally.

ALARES MUSCULI, in anatomy. See PTERYGOIDEIUS.

ALARES VENA, the inmoſt of the three veins in the bend of the arm.

ALARM, *n. s.* 1. A cry by which men are ſummoned to their arms; as, at the approach of an enemy.—2. A cry, or notice, of any danger approaching; as, an *alarm* of fire. 3. Any tumult or diſturbance.

Alarm, in fencing, denotes a ſtep, or ſtamp, made on the ground with the advancing foot; and is alſo called an appeal or challenge.

To Alarm, *v. a.* 1. To call to arms.—2. To diſturb; as, with the approach of an enemy.—3. To ſurpriſe with the apprehenſion of any danger.—4. To diſturb in general.

ALARMBELL, *n. s.* the bell that is rung at the approach of an enemy.

ALARMING, *part. adj.* terrifying; awakening; ſurpriſing.

ALARMPOST, *n. s.* the poſt or place appointed to each body of men to appear at, when an alarm ſhall happen.

ALARUM, *n. s.* [corrupted, as it ſeems, from *alarm.* See Alarm.]

Alarum, is alſo uſed for an inſtrument to awaken perſons at a certain hour; one very ſimple contrivance of this kind is that uſed by weavers. See Weaver's alarm.

To Alarum, *v. a.* [corrupted from *To alarm.*] See Alarm.

ALAS, *interject.* 1. A word expreſſing lamentation, when we uſe it of ourſelves.—2. A word of pity, when uſed of other perſons.—3. A word of ſorrow and concern, when uſed of things.

ALAS THE DAY, *interject.* Ah, unhappy day!

Alas the while, *interject.* Ah, unhappy time!

ALASKA, a long peninſula on the NW. coaſt of America, formed by Briſtol Bay and the ocean on the N. and NW. and by the ocean and Cook's river on the S. and SE. It lies between 54. and 55. N. Lat. and extends from the 86th to the 97th degree of W. Long. At its extremity, are a number of iſlands, the chief of which are Oonemak, Oonalaſha, and Ocumnak, which form part of the cluſter of iſlands called the Northern Archipelago. See America, north-west coast of.

ALATAMAHA, a navigable river of Georgia, about 60 miles ſouth of Savannah river, has its ſource in the Cherokee mountains, near the head of Tugulo, the great weſt branch of Savannah; and, before it leaves the mountains, is joined and augmented by innumerable rivulets; thence it deſcends through the hilly country, with all its collateral branches, and ſpreads rapidly amongſt the hills 250 miles, and then enters the flat, plain country by the name of the flat *Oakmulgee*; thence meandering 150 miles, it is joined on the eaſt ſide by the *Oconee*, which likewiſe heads in the lower ridges of the mountains. After this confluence, having gained a vaſt acquiſition of water, it aſſumes the name of Aaltamaha, when it becomes a large majeſtic river with gentle windings, through a vaſt plain foreſt, near 100 miles, and enters the Atlantic by ſeveral mouths. The north channel, or entrance, glides by the height of Darien, on the eaſt bank, about 10 miles above the bar; and running from thence, with ſeveral turnings, enters the ocean between Sepello and Wolf iſlands. The ſouth channel, which is eſteemed the largeſt and deepeſt, after its ſeparation from the north, deſcends gently, winding by M'Intoſh's and Broughton iſlands; and laſtly by the weſt coaſt of St. Simon's iſland, enters the ocean, through St. Simon's ſound, between the ſouth end of the iſland of that name, and the north end of Jekyl's iſland. On the weſt banks of the ſouth channel, 10 or 12 miles above its mouth; and nearly oppoſite Darien, are to be ſeen the remains of an ancient fort: it is now a regular tetragon terrace, about 4 feet high, with baſtions at each angle: the area contains about an acre of ground, but the foſſe which ſurrounded it, is nearly filled up. It is ſuppoſed to have been the work of the French or Spaniards. A large ſwamp lies between it and the river, and a conſiderable creek runs cloſe by the works, and enters the river through the ſwamps a ſmall diſtance above Broughton iſland. About 70 or 80 miles above the confluence of the Oakmulgee and Oconee, the trading path from Auguſta to the Creek nation croſſes theſe fine rivers, which are there 40 miles apart. On the eaſt banks of the Oakmulgee, this trading road runs nearly two miles through ancient Indian fields, which are called the Oakmulgee Fields: they are the rich low lands of the river. On the heights of theſe low grounds, are yet viſible, monuments or traces of an ancient town, ſuch as artificial mounds or terraces, ſquares, and banks encircling conſiderable areas. Their old fields and planting land extends up and down this river, 15 or 20 miles from this ſite: and if we are to give credit to the account which the Creeks give of themſelves, this place is remarkable for being the firſt town or ſettlement in which they ſat down [illegible] they term it) or eſtabliſhed themſelves, after thei [illegible] from the weſt, beyond the Miſſiſippi, their or [illegible] y.

ALATE, *adv.* lately; no long time ago.

ALATED LEAVES, among botaniſts, thoſe made up of ſeveral pinnated ones; as the *orobus*. See LEAF.

ALATERNOIDES, a name given by botaniſts to the caſſine.

ALATERNUS, in botany, the trivial name of a ſpecies of the rhamnus. See RHAMNUS.

ALAUDA, in ichthyology. See BLENNIUS.

ALAUDA, or LARK, in ornithology, a genus of birds of the order of paſſeres; the characters of which are theſe: The beak is cylindrical, ſubulated, ſtraight; and the two mandibles or chaps, are of equal ſize. The tongue is bifid, and the hinder claw is ſtraight, and longer than the toe. There are 28 ſpecies of the alauda, of which the following are the moſt remarkable.

1. ALAUDA ALPESTRIS: the chief wing-feathers are half white, the throat yellow, and it has a black ſtreak under the eyes, and on the breaſt. It inhabits North America, where it is migratory. It viſits the neighbourhood of Albany, the beginning of May, and goes farther north to breed. In winter it comes in vaſt flocks into Virginia and Carolina, returning north in ſpring. It feeds during its ſtay in the ſouthern parts, on oats and other grain; and while at Albany, on the graſs and the buds of ſprig-birch. It runs into holes; whence the natives of theſe laſt parts have given it the name of *chi-chup-pi-ſuc*. The Engliſh call it the *ortolan*, and reckon it delicious eating. By ſome it is called *ſnow-bird*, as being very plenty in that ſeaſon. It is frequently caught in great numbers by means of horſe-hair ſprings placed in ſome bare place, the ſnow being ſcraped away, and a little chaff ſtrewed about. It was always ſeen on the ground, and has little or no ſong. This bird is not peculiar to North America; we hear of it in Germany alſo; and it is plentiful throughout Ruſſia and Siberia, going northward in ſpring.

2. ALAUDA ARBOREA, or woodlark, is a native of Europe, and is diſtinguiſhed by an annular white fillet about the head. It is inferior in ſize to the ſky-lark, and is of a ſhorter thicker form; the colours, are paler, and its note is leſs ſonorous, and leſs varied, though not leſs ſweet. It perches on trees, and whiſtles like the black-bird. It will ſing in the night; and, like the common lark, ſings as it flies. It builds on the ground, and makes its neſt on the out-ſide with moſs, within of dried bents, lined with a few hairs. It lays five eggs, duſky and blotched with deep brown marks, darkeſt at the thicker end. The males of this and of the pratenſis are known from the females by their ſuperior ſize. But this ſpecies is not near ſo numerous as that of the common kind.

3. ALAUDA ARVENSIS, or common ſky lark. This and the woodlark are the only birds that ſing as they fly; this raiſing its note as it ſoars, and lowering it till it quite dies away as it deſcends. It will often ſoar to ſuch a height that we are charmed with the muſic when we loſe ſight of the ſongſter; it alſo begins its ſong before the earlieſt dawn. Milton, in his Allegro, moſt beatifully expreſſes theſe circumſtances; and biſhop Newton obſerves, that the beautiful ſcene that Milton exhibits of rural cheerfulneſs, not only gives us a fine picture of the regularity of his life, but of the innocency of his own mind. It continues its harmony ſeveral months, beginning early in the ſpring, on pairing. They build their neſt on the ground, beneath ſome clod, forming it of hay, dry fibres, &c. and lay 4 or 5 eggs.

4. ALAUDA CAMPESTRIS has one half of its chief feathers of the wings brown, except two in the middle which are white, and the throat and breaſt are yellowiſh.

5. ALAUDA CRISTATA: the chief tail-feathers are black, but the two outermoſt are edged with white, and the head is creſted. It is a native of Europe. It ſings well, like the ſky-lark: lays 4 or 5 eggs; and is ſaid to hatch twice in a year.

6. ALAUDA MAGNA, the great lark, is yellow on the belly, with a crooked black ſtreak on the breaſt, and the three ſide feathers of the tail white. It is a native of Africa and America.

7. ALAUDA PRATENSIS, or tit-lark, has the two outward feathers of the wings edged with white, and frequents the meadows. It is found frequently in low marſhy grounds: like other larks, it builds its neſt among the graſs, and lays five or ſix eggs. Like the wood-lark, it ſits on trees; and has a moſt remarkable fine note, ſinging in all ſituations, on trees, on the ground, while it is ſporting in the air, and particularly in its deſcent. This bird, with many others, ſuch as the thruſh, black-bird, willow-wren, &c. become ſilent about midſummer, and reſume their notes in September: hence the interval is the moſt mute of the year's three vocal ſeaſons, ſpring, ſummer and autumn. Perhaps the birds are induced to ſing again, as the autumnal temperament reſembles the vernal.

ALB, *n. s.* a ſurplice; a white linnen veſtment worn by prieſts. It was alſo a white veſtment, uſually worn for 8 days, in the ancient churches, by thoſe newly baptized.

ALB is alſo the name of a Turkiſh coin, otherwiſe called *aſper*. See ASPER.

ALBA, an ancient town of the Marſi in Italy, ſituated on the north ſide of the Lacus Fucinus, which ſtill retains its original name. It ſtands upon an eminence, and is noted in Romam hiſtory for being the ſtate-priſon where captive princes were ſhut up after being barbarouſly dragged thro' the ſtreets of Rome at the chariot wheels of a triumphant conſul. Peſes, king of Macedon, terminated his wretched career in this confinement, with his ſon, the laſt hope of an illuſtrious line of kings. Syphax the Numidian, and Bituinus, king of the Averni, were alſo condemned to this goal by the particular clemency of the Senate, which ſometimes indulged its ſavage diſpoſition by putting its enemies to death. Alba, being ſituated in the centre of Italy, amidſt difficult mountainous paſſes, and far from all means of eſcape, was eſteemed a moſt proper place for the purpoſe of guarding priſoners of importance. Artificial ſtrength was added to its natural ſecurity by fortifications, which remain to this day in a ſtate that proves their ancient ſolidity.

ALBA LONGA, in ancient geography, a colony from Lavinium, in Latium, eſtabliſhed by Aſcanius the ſon of Æneas, at the foot of the Mons Albanus: called *Alba*, from a white ſow found by Æneas, which farrowed 30 white pigs on that ſpot; which circumſtance was interpreted to portend the building of a city there in 30 years after. The epithet *Longa* was added on account of its length. It was the royal reſidence till the building of Rome; but was deſtroyed by Tullius Hoſtillius, all but the fane or temple; and the inhabitants were tranſplanted to Rome.

ALBANENSES, in church hiſtory, the ſame with ALBIGENSES, which ſee.

ALBANIA, a country of Aſia, bounded on the W. by Iberia; on the E. by the Caſpian ſea; on the N. by mount Caucaſus; and on the S. by Armenia, and the river Cyrus, now Kur; which, ſpringing from the Moſchian mountains that ſeparate Colchis from Armenia, and watering the country of Mokan, receives the Aragus and Araxus, and falls into the Caſpian ſea within a ſmall diſtance from the ſouthern borders of this country.—The whole country formerly called *Alcania*, now goes under the names of *Shirwan* and *East Georgia*, and is extremely fruitful and pleaſant.

ALBANIA, or ARNAULT LAROS, a province of Turkey in Europe, on the gulph of Venice, bounded by Livadia on the S. by Theſſaly and Macedonia on the E. and on the N. by Boſnia and Dalmatia. The people are ſtrong, large, courageous, and good horſemen; but are ſaid to be of a thieviſh diſpoſition: the grand Signior procures excellent ſoldiers from hence, particularly cavalry, known by the name of *Arnauts*. There are ſeveral large towns in this province; and the inhabitants are almoſt all Chriſtians of the Greek church, and deſcended from the ancient Scythians. Formerly it was part of the kingdom of Macedonia. Their chief manufacture is carpets. The principal places are Durazzo, Velona, Antivari, Scutari, Croya, Aleſſo, Dibra, Dolcigno, and Albanapoli. Long. from 91, to 97, E. Lat. from 39, to 43, 30, N.

ALBANO, a town of Italy, ſeated on a lake of the ſame name. It was called by the ancients *Albanum Pompeii*, and built out of the ruins of the ancient Alba Longa, which was deſtroyed by Tullius Hoſtillius. It ſtands within 12 miles S. E. of Rome, and for the pleaſantneſs of its ſituation, is the ſummer retirement of a great many Roman princes. It is likewiſe the ſee of a biſhop, who is one of the ſix ſenior cardinals. The town is famous for its excellent wine, and the ruins of a mauſoleum, which, according to the tradition of the inhabitants, was made for Aſcanius. The proſpect from the garden of the Capuchins is extremely pleaſant, taking in the Campania of Rome, and terminating in a full view of the Tuſcan ſea. Near the Capuchins there is another convent of Franciſcans; and not far from thence the palace of Cardinal Barberini, remarkable for very pleaſant gardens, with the ruins of ancient baths, and ſeveral old fragmens of Moſaic work. Long. 37, 50, E, Lat. 41. 43, N.

ALANOIS. See ALBIGENSIS.

ALBANY COUNTY, on Hudſon's river, in the State of New-York, lying between the couties of Green and Saratoga, is 46 miles in length, and 28 in breadth. It contains 11 townſhips.

ALBANY, the chief town of the above county, is ſituated upon the weſt bank of Hudſon's river, and by enumeration in 1797, contained 1263 buildings; of which, 863 were dwelling houſes, and 6021 inhabitants. But from its having become the ſeat of the ſtate government ſince that period, the rapid improvements which have taken place in the city and its vicinity, and its being heretofore exempt from peſtilence, at thoſe periods, when many of our American cities were ſeverely afflicted with that ſcourge, its population has by this time (1802) greatly increaſed. According to the charter of this city, granted in the year 1686, it was to extend one mile along the river, and 16 miles back, and to be governed by a mayor, recorder, 6 aldermen, and as many aſſiſtants. The houſes, built on the riſing ground from the margin of the river, are moſtly in the Dutch Gothic ſtyle, with the gable end to the ſtreet, which cuſtom the firſt ſettlers may have brought with them from Holland. The gable end is commonly of brick, with the heavy moulded ornament of flaunting with nitches, like ſtairs, and an iron crane nearly the ſhape of a lamp iron above the higheſt window, with an iron horſe for a weather-cock at top. Theſe houſes, which are in general low, have but little convenience and ſtill leſs elegance,; but they are kept ſo neat and clean, as to entitle the inhabitants to great credit. Many new houſes, however, have lately been built in this city in the modern ſtyle.

The inhabitants of Albany being collected from all parts of the northern world; as great a variety of languages are ſpoken there as in any town of the United States, but the Engliſh predominates, and the uſe of every other is conſtantly leſſening. Adventurers in purſuit of wealth, are led here from the advantages for trade which this place affords: It being ſituated on one of the fineſt rivers in the world, and the *ſtore-houſe* of the trade to and from Canada and the lakes. It enjoys a ſalubrious air, as is evinced by the longevity of its inhabitants, and is the natural emporium of the increaſing trade of a large extent of country north and weſt; a country of an excellent ſoil, abounding in every article for the Weſt-India market; plentifully watered with navigable lakes, creeks and rivers; ſettling with almoſt unexampled rapidity, and capable of affording ſubſiſtence and affluence to millions of innabitants; and the contemplated locks and canals are completed, the b over the Mohawk river erected, and convenient r ed in every part of the country, (which, from the already made, will undoubtedly ſoon be accompli albany bids fair to encreaſe and flouriſh with a rap to that of any other town on the continent.

It is generally built on the ſide of the river, commodious wharf form a principal ſtreet, from the ferry to the elegant manſion of Stephen Van Renſ Eſq. a diſtance of upwards of two miles. The whole be conſidered as forming one continued ſtreet, only aſſumes different names in different places. The prin ſtreets are State, Court, Pearl and Waſhington ſtreets. en-lane, Watervliet, beſides about 25 or 30 ot and lanes, all of which are well paved, with ſide w ter the New-York plan. At the upper end, near the of State-ſtreet ſtands the Epiſcopal church, and a bottom the old Dutch Church, both of which tend terrupt the beauty of the ſtreet. Amongſt the va provements in contemplation by the inhabitants, the ling down of theſe churches, and rebuilding them in a eligible ſituation one is highly important. Upon the w the city has a handſome appearance from the river, as principally built on a riſing ground.

The well water in this city is extremely bad, ſo that ſcarcely drinkable by thoſe who are unaccuſtomed to It oozes through a ſtiff blue clay, and imbibes in its ſage, the fine particles common to that kind of ſoil. diſcolours it, and when expoſed at any length of air it acquires a diſagreeable taſte. Indeed, all for cooking was, till within theſe few years, brought from the river, and many families uſed it for drink; but excellent water is now conducted into the various parts of the city, from a fine ſpring riſing nearly in the centre of a wood, about five miles to the weſtward. The public buildings are two Dutch Churches; one of which is of ancient and very curious conſtruction; one for Epiſcopalians, three for Preſbyterians, one for Germans, one for Methodiſts, one for Baptiſts; and one for Catholics; a city hall in which the public courts and ſtate legiſlature ſits; an hoſpital; a ſtate-houſe, in which the public offices are held; an arſenal, and a handſome brick jail. There is alſo in this city, an elegant and commodious building called the city hotel, a public market, and a bank eſtabliſhed in 1794. It is ſituated about 160 miles north of the city of New-York, and 340 miles S. S. W. of Quebec, in 42. 39. N. Lat. and 1. 30. E. Long.

About one mile north of this city, in its ſuburbs, are the extenſive and uſeful patent works of Mr. James Caldwell and Co. for the manufacture of ſnuff and tobacco, hair-powder, ſtarch, chocolate, hulled barley, and ſplit peas, in which are employed conſtantly, nearly 50 boys, beſides journeymen. The works of theſe gentlemen have been twice unfortunately deſtroyed by fire; once in 1794, and again in 1699. The loſs, which the proprietors ſuſtained upon both theſe occaſions, was very great; but it is highly evincive of their induſtry and enterprize, that by no means daunted at their misfortunes, they ſtill perſevere, and their works are again re-eſtabliſhed upon a more extenſive and improved ſcale than heretofore. Theſe works are decidedly ſuperior to any of the kind in this country, as all the articles above ſpecified, even the ſpinning of tobacco, are manufactured by means of water machinery, erected on a plentiful ſtream, which empties into the Hudſon, on which are ſeveral griſt-mills, a ſaw-mill, &c. Men who have made ſuch efforts to advance the infant manufactures of America, ſhould be mentioned with honour, as they may be ſaid, in a peculiar manner, to deſerve well of their country.

About two miles to the ſouthward of the city, is a bridge over a creek, of a curious conſtruction, lately built by the city corporation. The bridge is wholly built of inch and inch and a half planks, ſuſpended from three arches built of the ſame materials; the whole is reckoned a piece of excellent workmanſhip, and a great curioſity.

Albany, a Britiſh fortreſs, to the ſouth weſtward of Hudſon's Bay, in North America, ſituated on a river of the ſame name. Lat. 53. 10. N. Long. 12. 20. W.

Albany River falls into James's Bay, in North America, in Lat. 51. 30. N. and 9. 80. W. Long. The mouth of this, as well as all the other rivers, which empty into James's and Hudſon's Bay from the weſt, are filled with ſhoals, except Churchill's river, in which the largeſt ſhips may lie; but 10 miles higher up, the channel is obſtructed by ſand banks All thoſe rvers, as far as they have been explored, are full of rapids and cataracts, many feet perpendicular, ſo that tho' the Indian traders find a quick paſſage towards the ſea, their return is a labour of many months.

ALBARA, in botany, the white popular.

ALBARDEOLA, in ornithology, a name given by many authors to the platea, or ſpoon bill; a bird approaching to the nature of the heron.

ALBEIT, *adv.* although; notwithſtanding; thought it ſhould be.

ALBELEN, in ichthyology, the name of a fiſh of the truttaceous kind, called alſo *albula*, and much reſembling the *ſerra*. It is caught in the German and other lakes, and is found from 5 or 6 to 12 lb. weight. Its colour is a fine ſilvery white.

ALBEMARLE Sound, on the coaſt of North Carolina, is a kind of inland ſea, about 60 miles in length, and from 8 to 18 in breadth. The paſſage into this ſound from the ſea is called Roanoke Inlet. It likewiſe communicates with Currituck Inlet and Pamlico Sound, and receives the rivers Meherrin and Roanoke. See Pamlico and Roanoke.

ALBI, an ancient city of France, in the department of Tarn, ſeated on the river of that name, which waſhes its walls and ſerves both for defence and ornament. It is ſituated 335 miles S. from Paris, 50 S. by W. of Rhodez, and 42 N. E. of Toulouſe. It is the chief city of the Albigeois, and was the ci-devant ſee of an archbiſhop. The cathedral was dedicated to St. Cecilia, and before the revolution, was (if it is not ſtill) ornamented with a valuable ſilver ſhrine, of exquiſite workmanſhip, of the Moſaic kind; Long. 77. 14. E. Lat. 44. 15. N.

ALBIFICATION, in chemiſtry, the whitening of metals or liquors.

ALBIGENSES, in church hiſtory, a party of reformers about Toulouſe and the Albigeois in Languedoc, who ſprung up in the 12th century, and diſtinguiſhed themſelves by their oppoſition to the diſcipline and ceremonies of the church of Rome. This ſect had their name, it is ſuppoſed, either becauſe there were great numbers of them in the dioceſe of Albi, or becauſe they were condemned by a council held in that city. The *Albigenses* were alſo called *Albiani*, *Albigessei*, *Albii*, and *Albanenses*, though ſome diſtinguiſh theſe laſt from them. Other names given to them are, *Henricians*, *Abelardists*, *Bulgarians*, &c. ſome on account of the principles they aſſumed; others from the country from whence it is pretended they were derived; and others on account of perſons of note who adopted their cauſe, as Peter de Brius, Arnold de Breſſe, Abelard, Henry, &c. Berengarius, if not Wickliff himſelf, is by ſome ranked in the number. The Albigenſes are frequently confounded with the Waldenſes; from whom, however, they differ in many reſpects, both as being prior to them in point of time, as having their origin in a different country, and as being charged with divers hereſies, particularly Manicheiſm, from which the Waldenſes are exempt. But ſeveral Proteſtant writers have vindicated them from that imputation. Dr. Allix ſhows, that a great number of Manichees did ſpread over the weſtern countries from Bulgaria; and ſettled in Italy, Languedoc, and other places, where they were alſo called Albigenſes; by which means, being both under the imputation of hereſy, they came, either by ignorance or malice, to be confounded, and called by the ſame common name, though in reality entirely different. Other errors imputed to them, by their perſecutors, the monks of thoſe days, were; That they admitted two Chriſts; one evil, who appeared on earth; the other good, who has not yet appeared; That they denied the reſurrection of the body; and maintained human ſouls to be dæmons impriſoned in our bodies, by way of puniſhment for their ſins; That they condemned all the ſacraments of the church; rejected baptiſm as uſeleſs; held the euchariſt in abhorrence; and maintained marriage to be unlawful. Theſe appear to be calumnies circulated againſt them, becauſe they laughed at purgatory, prayers for the dead, images, crucifixes, confeſſions, and penance, &c. There were likewiſe ſaid to be two claſſes of them; the Perfect and the Believers. The perfect boaſted of their living in continence, of eating neither fleſh, eggs, nor cheeſe. The believers lived like other men, and were even looſe in their morals; but they were perſuaded they ſhould be ſaved by the faith of the perfect, and that none were damned who received impoſition of hands from them. But from theſe charges alſo they are generally acquitted by proteſtants; who conſider them as calumnies invented by the Romiſh church, to blacken thoſe whom they looked on as heretics. However this be, the Albigenſes grew ſo formidable, that the Catholics agreed upon a holy league or croiſade againſt them.—They were at firſt ſupported by Raimond count of Toulouſe. Pope Innocent III. deſirous to put a ſtop to their progreſs, ſent a legate into their country; which failing, he ſtirred up Philip Auguſtus, king of France, and the other princes and great men of the kingdom, to make war upon them.—Upon this, the count of Toulouſe, who had ſided with them, made his ſubmiſſion to the pope, and went over to the Catholics: but ſoon after, finding himſelf plundered by the croiſaders, he declared war againſt them, and was joined by the king of Arragon. His army was defeated at the ſiege of Muret, where he himſelf was killed, and the defeat followed by the ſurrender of the city of Toulouſe, and the conqueſt of the greateſt part of Languedoc and Provence.—His ſon Raimond ſucceeded him; who agreed with the king and the pope to ſet up the inquiſition in his eſtates, and to extirpate the Albigenſes. In an aſſembly held at Milan, the archbiſhop of Toulouſe drew up articles; agreeably to which the count made a moſt ample declaration againſt them, which he publiſhed at Toulouſe, in 1253.—From this time the Albigenſes dwindled by little and little, till the times of the reformation; when ſuch of them as were left fell in with the Vaudois, and became conformable to the doctrine of Zuinglius and the diſciples of Geneva.

Albigenses is alſo a name ſometimes given to the followers of Peter Vaud, or Waldo; and hence ſynonymous with Waldenſes, or Poor Men of Lyons. In this ſenſe the word is applied by Camerarius, Thuanus, and ſeveral other writers. The reaſon ſeems to be, that the two parties agreed in their propoſition to the papal innovations and encroachments, though in divers other reſpects they are very different. The biſhop of Meaux labours hard to ſupport a diſtinction between the two ſects, alledging, that the Albigenſes were heretics and Manichees; whereas the Waldenſes were only ſchiſmatics, not heretics; being ſound as to articles of faith, and only ſeparating from the church of Rome, on account of forms and diſcipline. Dr. Ailix endeavours to ſet aſide the diſtinction; and ſhows, that both of them held the ſame opinions, and were equally condemned and held for heretics; and this not for points of faith, but for declaiming againſt the papal tyranny and idolatry, and holding the people to be the Antichriſt; which laſt, according to the biſhop of Meaux, conſtitutes little leſs than Manicheiſm. In this ſenſe, the Lollards and Wickliffites in England were not only Albigenſes but Manichees. See Manichees.

ALBIGEOIS, a ſmall territory of France, in Upper Languedoc, about 27 miles in length, and 20 in breadth, abounding in corn, wood, excellent wines, flax, hemp, aniſeed, coriander, ſaffron, plumbs, and ſheep. The inhabitants drive a great trade in dried prunes, grapes, and coarſe cloth; and alſo manufacture ratteens, ſhalloons, ſtockings, coarſe woollens, &c.

ALBIGESEI, or Albii. See Albigenses.

ALBINOS, the name by which the Portugueſe call the white Moors, who are looked upon by the negroes as monſters. They at a diſtance might be taken for Europeans; but, upon a near inſpection, their white colour appears like that of perſons affected with a leproſy. Several inſtances of perſons born black, having become white, have lately occurred in the United States. The moſt remarkable of theſe, together with the cauſes aſſigned by Philoſophers for this extraordinary phenomenon, will be particularly noticed under the article Negroes White.

ALBION, in ancient geography, [from *album*, *white*, Lat.] the iſland of Great-Britain, ſo called by Cæſar, on account of the chalky cliffs on the Engliſh coaſt.

Albion New, the name given by Sir Francis Drake, to the peninſula of California and a large part of the north weſt coaſt of America, when he took poſſeſſion of it, in the year 1579. Captain Cook landed on a part of this coaſt on the 7th of March 1778, in 44. 33. N. Lat. and 49. 40. W. Long. which he thus deſcribes. "The land was full of mountains, the tops of which were covered with ſnow, while the vallies between them and the ground on the ſea coaſt, high as well as low, were covered with trees, which formed a beautiful proſpect as of one vaſt foreſt. At firſt, the natives ſeemed to prefer iron to every other article of commerce; but, at laſt, they ſhewed ſuch a predilection for braſs that ſcarcely a bit of it was left in the ſhips, except what belonged to the neceſſary inſtruments. It was obſerved alſo, that theſe people were much more tenacious of their property than any of the ſavage nations, that had hitherto been met with; inſomuch that they would part neither with wood, water, graſs, nor the moſt trifling article without a compenſation, and were ſometimes very unreaſonable in their demands." See America, North West Coast of.

ALBIREO, a ſtar of the third or fourth magnitude, in the conſtellation of *Cygnus*.

ALBIS, in ancient geography, now the Elbe, which divided ancient Germany in the middle, and was the boundary of that country, ſo far as was known to the Romans: all beyond it, they reckoned uncertain, no Roman except Druſus, and Tiberius having penetrated ſo far as the Elbe. In A. U. C. 744, or about ſix years before Chriſt, Domitius Ænobarbus, croſſing the river with a few, merited a triumph; ſo glorious was it reckoned at Rome to have the paſſage accompliſhed. In the following age, however, the river that before occupied the middle of ancient Germany, became its boundary to the north, from the irruptions of the Sarmatæ, who poſſeſſed themſelves of the Tranſalbin Germany. See Elbe.

ALBOGALERUS, in Roman antiquity, a ſacerdotal cap, or ornament worn by the prieſt, ſtiled *ſtamen dialis*, which is otherwiſe called *galerus*.

ALBORAK, amongſt the Mahometan writers, the beaſt on which Mahomet rode in his journey to heaven. The Arab commentators give many fables concerning this extraordinary vehicle. It is repreſented as of an intermediate ſhape and ſize between an aſs and a mule. A place, it ſeems, was ſecured for it in paradiſe at the interceſſion of Mahomet; which, however, was in ſome meaſure extorted from the prophet, by Alborak's refuſing to let him mount him, when the angel Gabriel was come to conduct him to heaven.

ALBUCA, Baſtard Star of Bethlehem: a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 10th order, Coronariæ. The characters are: The calyx is wanting: The corolla conſiſts of ſix oval oblong petals, which are perſiſtent: The ſtamina conſiſts of ſix three-ſided filaments the length of the corolla; of theſe, three are fertile, with verſatile antheræ: three are barren without antheræ. The piſtillum has an oblong three-ſided germen; the ſtylus is three-ſided: The pericarpium is an oblong obtuſe triangular capſule, having three cells and three valves: The ſeeds are numerous, flat, and incumbent. Of this genus Linnæus reckons only two ſpecies; viz.

1. Albuca Major, or ſtar flower, with ſpear-ſhaped leaves. This is a native of Canada, and alſo of the United States of America. The root is bulbous; from whence ſhoot up eight or ten long, narrow, ſpear-ſhaped leaves. In the centre of theſe ariſes a flower ſtem, a foot or more in height, garniſhed with a looſe ſpike of greeniſh yellow flowers. After the flowers are paſt, the germen ſwells to a three-cornered capſule, leaving three cells filled with flat ſeeds.

2. Albuca minor, or African ſtar flower, is a native of the Cape of Good Hope. This hath alſo a pretty large bulbous root, from which ariſe four or five narrow awl-ſhaped leaves, of a deep green colour; the flower ſtem, which comes from the centre of the root, is naked, and rarely riſes more than eight or nine inches high, having five or ſix greeniſh yellow flowers, growing almoſt in the form of an umbel at top. This ſpecies generally flowers twice a-year; firſt in March or April, and again in July or Auguſt; and if its roots are kept in pots filled with light earth, ſheltered under a hot-bed frame, they will flower even in winter; but the beſt method is to have a border in the front of a green houſe, or ſtove, where the roots of moſt of the bulbous flowers may be planted in the full ground, and ſcreened in winter from froſt: in ſuch ſituations they thrive much better, and flower ſtronger, than when kept in pots.

ALBUGINEA, in anatomy, the outermoſt coat, or tegument of the eye; otherwiſe called *aduata*, and *conjunctiva*. It takes its name *albuginea* from its whiteneſs; and it is this that forms what we call the *album*, or white of the eye. Albuginea is alſo applied to the third coat of the teſticles; ſo called from its colour, which is white. It is a ſtrong thick membrane, very ſmooth on the outer ſurface; the inner, which adheres to the ſurface of the teſtacle, being rough and uneven. In its upper part are inſerted blood veſſels, nerves, and lymphatics, which from thence ſend divers branches into the ſubſtance of the teſticles.

ALBUGINEOUS, *adj.* reſembling an albugo.

ALBUGINEUS, in anatomy, a term ſometimes applied to the aqueous humour of the eye.

ALBUGO, *n. s.* a diſeaſe in the eye, by which the cornea contracts a whiteneſs.

ALBULA, in ichthyology, a genus of fiſhes of the truttaceous kind, having no teeth. The principal ſpecies are,

1. Albula indica, a ſmall fiſh, reſembling a herring, caught about the ſhores of the Eaſt Indies, and called by the Dutch the wit-fiſh.

2. Albula nobilis, a truttaceous fiſh caught in great plenty in the lakes of Germany, and other places.

Albula, in natural hiſtory, mineral waters of aluminous kind; hence endowed with an aſtringent quality, and of uſe in wounds.

ALBUM, in alchemy, a tincture pretended to tranſmute metals.

Album, in chemiſtry, white lead, or *cerus*.

Album, in natural hiſtory, is uſed for the white of an egg; more properly called *albumen*.

Album, in pharmacy, is applied to divers compound medicines, of a white colour, as *unguentum album*, white ointment, &c.

ALBUMEN, the white of an egg, according to Boerhaave, makes an extraordinary menſtruum. Boiled hard in the ſhell, and afterwards ſuſpended in the air by a thread, it reſolves and drops down into an inſipid and ſenſeleſs liquor, which appears to be that anomalous unaccountable menſtruum ſo much uſed by Paracelſus; and will, though it contains nothing ſharp, oleaginous, or ſaponaceous, make a thorough ſolution of myrrh; which is more than either water, oil, ſpirits, or even fire itſelf can effect. A little putrid white of egg taken into the ſtomach, occaſions nauſea, horror, fainting, vomiting, diarrhœa, and gripes; it inflames the bile, excites heat, thirſt, fever; and diſſolves the humours like the plague. On the contrary, the white of freſh-laid eggs, if taken while warm from the hen, is extremely nouriſhing to the infirm: it may be taken in lukewarm tea; but if any other heat is applied to it, the nutritious quality will be diminiſhed. The freſh white of eggs prevents burns from riſing in bliſters, if it is uſed immediately after the accident: it mitigates inflammations of the eyes, and preſerves the face from ſun-burning. In pharmacy, it is uſed as a medium to render balſams and turpentine, &c. miſcible with aqueous fluids; but as it diſagrees with many ſtomachs when thus taken a mucilage of gum arabic may ſupply its place; it being as good a medium in ſimilar circumſtances, and not apt to offend the tendereſt ſtomach.—Whites of eggs are alſo uſeful for clarifying liquors; for which purpoſe, being mixed and incorporated with the liquors to be clarified, and the whole afterwards boiled, the whites of eggs are by this means brought together and hardened, and thus carry off the groſs parts of the liquor along with them. See Egg.

ALBUM græcum, among phyſicians, the white dung of dogs, formerly preſcribed for inflammations of the throat, &c. but now juſtly deſpiſed.

Album nigrum, is uſed, among medical writers, for mice dung, by ſome called *muscerda*.

Album oculi, among anatomiſts, the *tunica adnata*; alſo called *albuga*; or the white of the eye.

ALBURN, ſee auburn.

ALBURNUM, the ſoft white ſubſtance which in trees is found between the liber, or inner bark, and the wood, and in progreſs of time acquiring ſolidity, becomes itſelf the wood. From its colour and comparative ſoftneſs, it has been ſtyled by ſome writers *adeps arborum*, the fat of trees. The alburnum is found in large quantities in trees that are vigorous; though in ſuch as languiſh, or are ſickly, there is a great number of beds. In an oak, ſix inches in diameter, this ſubſtance is nearly equal to the bulk of the wood. In a trunk of one foot diameter, it is as one to three and a half; of two and a half feet diameter, as one to four and a half, &c. but theſe proportions vary according to the health and conſtitution of the trees.—The alburnum is frequently gnawed in pieces by inſects, which lodge in this ſubſtance, and are nouriſhed from it.

ALBY, in France, See Albi.

ALCA, or Auk, in ornithology, a genus of the order of anſeres. The beak of this genus is without teeth, ſhort, convex, compreſſed and frequently furrowed tranſverſely: the inferior mandible is gibbous near the baſe; the feet have generally three toes. There are 12 ſpecies of the alca, of which the moſt remarkable are,

1. **Alca alle**, the little auk, or black and white diver, with a ſmooth conical bill, a white ſtreak on the belly and wings, and black feet. The ſize of this ſpecies exceeds not that of a black-bird. It is not very common in Britain, but ſeems to be plentiful towards the north of Europe, being met with in various parts as far as Spitzbergen. It is common in Greenland, in company with the black-billed ſpecies; and lays two blueiſh white eggs, larger than thoſe of a pigieon. It flies quick, dives well, and grows fat in the ſtormy ſeaſon, from the waves bringing plenty of crabs and ſmall fiſh within its reach; but from its ſize it is leſs ſought after than the others. In Greenland it is called the *ice-bird*, being the harbinger of ice. This ſpecies is ſometimes ſeen of a pure white.

2. **Alca arctica**, or the puffin, with a compreſſed bill and four furrows; the orbit of the eyes and temples are white. The legs of this ſpecies are very ſmall; and placed ſo far behind as to diſqualify it from ſtanding except quite erect, reſting not only on the foot, but the whole length of the leg. This circumſtance, which likewiſe attends every one of the genus, makes the riſe of the puffin from the ground very difficult, and it meets with many falls before it gets on wing; but when it is effected, few birds fly longer or ſtronger. Theſe birds frequent the coaſts of ſeveral parts of Great-Britain and Ireland; but no place in greater numbers than Prieſtholm Iſle, where their flocks may be compared to ſwarms of bees for multitude. They are birds of paſſage; and reſort there annually about the 5th or 10th of April, quit the place, almoſt to a bird, and return twice or thrice, before they ſettle to burrow and prepare for ovation and incubation. They begin to burrow the firſt week in May; but ſome few ſave themſelves that trouble, and diſlodge the rabbits from thier holes, taking poſſeſſion of them till their departure. Thoſe which form their own burrows, are at that time ſo intent on the work as to ſuffer themſelves to be taken by the hand. This taſk falls chiefly to the ſhare of the males; who alſo aſſiſt in incubation. The firſt young are hatched the beginning of July. The old ones ſhew vaſt affection towards them; and ſeem totally inſenſible of danger in the breeding ſeaſon. If a parent is taken at that time, and ſuſpenned by the wings, it will in a ſort of deſpair treat itſelf moſt cruelly, by biting every part it can reach; and the monent it is looſed, will never offer to eſcape, but inſtantly reſort to its unfledged young: This affection ceaſes at the ſtated time of its migration, which is moſt punctually about the 11th of Auguſt, when they leave ſuch young as cannot fly to the mercy of the peregrine falcon, who watches the mouths of the neſts for the appearance of the little deſerted puffins, which, forced by hunger, are compelled to leave their burrows. They lay only one egg. The eggs differ much in form: they have one end very acute; others have both extremely obtuſe; all are white. Their fleſh is exceſſively rank, as they feed on ſea-weeds and fiſh, eſpecially ſprats: but when pickled and preſerved with ſpices, are admired by thoſe who love high eating. Theſe birds are alſo common in Ireland; on the iſland Sherries, three leagues N. N. W. of Holy-Head; and in the S. Stack, near Holy-head, they breed in plenty. They inhabit Iceland and Greenland; and breed in the extreme parts of the iſlands. This ſpecies is alſo found in the Ferroe iſles, where it is called *Lunda*; and in the Farn iſles, where it is called *Coulterneb*, from the ſhape of the bill. It goes alſo by various other names; ſuch as *Gulden-bead*, *Bottle noſe*, and *Helegug*, in Wales. In America they are ſaid to frequent Carolina in winter; and have been met with in Sandwich Sound by ſome late voyagers: the natives ornament the fore parts and collar of their ſeal-ſkin jackets with the beaks of them; and thoſe of Aoonalaſhka wear gowns of their ſkins, along with thoſe of other birds. On the coaſts of Kamtſchatka and the Kuruſchi iſlands they are common, even on the Penſchinſki Bay, almoſt as far as Ochotka: the nations of the two firſt wear the bills about their necks faſtened to ſtraps; and according to the ſupurſtition of theſe people, their ſhaman or prieſt muſt put them on with a proper ceremony, in order to procure good fortune.

3. **Alca cirrhata**, ſo called by Dr. Pallas, or tufted auk, is ſomewhat bigger than the common puffin, and the colours much the ſame: the bill is an inch and three quarters in length, the ſame in depth at the baſe, and croſſed with three furrows: over each eye ariſes a tuft of feathers four inches in length, which falls elegantly on each ſide of the neck, reaching almoſt to the back; and are white as far as they are attached to the head, but are afterwards of a fine buff yellow: the legs are of a bright red; the claws black. The female is principally diſtinguiſhed by having the bill croſſed only with two furrows inſtead of three. This ſpecies inhabits the ſhores of Kamptſchatka, the Kurile iſlands, and thoſe intervening between Kamptſkatka and America. In manners it greatly reſembles the puffin; living all day at ſea, but at no great diſtance from the rocks: it comes on ſhore at night; burroughs a yard deep under ground, and maks a neſt with feathers and ſea plants; is monogamous, and lodges there the whole night with its mate. It lays one white egg in the end of May or beginning of June, which alone is thought fit to be eaten, the fleſh of the bird itſelf being inſipid. The bills both of this and the common puffin were formerly held by the Kamtſchadales as a charm, and worn by the prieſts as amulets; indeed at the preſent time theſe have been fixed

round their head dreſſes, but ſuppoſed now to be only eſteemed as mere ornaments: the ſkins are, however, made uſe of for clothing, being ſewed together. It is called in Kamptſchatka *Maecbagatka*; and in Oſchotka, *Igilma*.

4. **Alca impennis**, the nothern penguin, or great auk, with a compreſſed bill furrowed on each ſide, and an oval ſpot on each ſide of the eyes. This bird breeds on the ſmall Scotch iſle of St. Kilda; appearing there the beginning of May, and retiring the middle of June. It lays only one egg, and if this is taken away, it will not lay another that ſeaſon. Mr. Macaulay informs us, that it does not viſit that iſland annually, but ſometimes keeps away for ſeveral years together; and adds, that it lays its egg cloſe to the ſea mark, being incapable, by reaſon of the ſhortneſs of its wings to mount higher. The length of this bird, to the end of its toes, is three feet; but its wings are ſo ſmall, as to be uſeleſs for flight; the length, from the tip of the longeſt quill feathers to the firſt joint, being only four inches and a quarter. This bird is obſerved by ſeamen never to wander beyond ſoundings; and according to its appearance they direct their meaſures, being then aſſured, that land is not very remote. It ſometimes frequents the coaſts of Norway, the Ferroe iſles, Iceland, Greenland, and Newfoundland; and feeds much on the lump fiſh, father-laſher, and other fiſh of that ſize. The ſkin between the jaws is blown into a bladder, and uſed for the darts of the Greenlanders, as is alſo that of other birds. The ſkin of the body is ſuppoſed to be uſed by the Eſquimaux Indians for garments.

5. **Alca psittacula**, or perroquet auk, of Dr. Pallas, is about the ſize of the little auk. The bill is much compreſſed on the ſides, in ſhape convex both above and below, and of a bright red colour: from the remote corner of each eye is a very ſlender tuft of fine white feathers, hanging down the neck: the head and upper part of the body are duſky; the lower whitiſh, varied with black edges: the legs are a dirty yellow; and the webs duſky. This ſpecies is found at Kamtſchatka, in the iſles towards Japan, and on the weſtern ſhores of America. They are ſometimes ſeen in flocks, but ſeldom far from land, except when driven by ſtorms. During night they harbour in the crevices of rocks. They lay an egg almoſt the ſize of a hen's, of a dirty white or yellowiſh colour, ſpotted with brown; which they do about the middle of June, upon the bare rock or ſand, for they make no neſt. Like moſt of the tribe, they are ſtupid birds, as is evinced by the method of catching them; One of the natives places himſelf under a looſe garment of fur, of a particular make, with large open ſleeves, among the rocks at evening; when the birds, returning to their lodging places at duſk, run under the ſkirts, and up the arm holes, for ſhelter during the night, and thus become an eaſy prey. Their ſtupidity likewiſe appears from their flying aboard ſhips, miſtaking them for rooſting places, whereby navigators have been taught to avoid the danger of falling in too near with land, either in the evenings, or on approaching ſtorms. The eggs are eſteemed good.

6. **Alca torda**, or the razor bill, with four furrows on the bill, and a white line on each ſide running from the bill to the eyes. Theſe birds, in company with the guillemot, appear in the Britiſh ſeas the beginning of February; but do not ſettle on their breeding places till they begin to lay about the beginning of May. They inhabit the ledges of the higheſt rocks that impend over the ſea, where they form a groteſque appearance; ſitting cloſe together, and in rows one above another. They properly lay but one egg a piece, of an extraordinary ſize for the bulk of the bird, being three inches long: it is either white, or of a pale ſea green, irregularly ſpotted with black: if this egg is deſtroyed, both the auk and the guillemot will lay another; if that is taken, then a third; they make no neſt, depoſiting their egg on the bare rock; and though ſuch multitudes lay contiguous, by a wonderful inſtinct, each diſtinguiſhes its own. What is alſo matter of great amazement, they fix their egg on the ſmooth rock with ſo exact a balance, as to ſecure it from rolling off; yet ſhould it be removed, and then attempted to be replaced by the human hand, it is extremely difficult, if not impoſſible, to find its former equilibrium. According to Mr. Latham, it is by means of a cement that the bird fixes its egg. The eggs are food to the indabitants of the coaſt they frequent, which they get with great hazard, being lowered from above by ropes, truſting to the ſtrength of their companions, whoſe footing is often ſo unſtable that they are forced down the precipice, and periſh together. Theſe birds are found in the north of Europe, alſo in Iceland, Greenland, and on the coaſt of Labrador. In Europe they extend along the White Sea into the Arctic Aſiatic ſhores, and from thence to Kamtſchatka and the gulph of Ochotka: They are the only ſpecies which reaches the inland Baltic; being found there on the Carls-Ozar iſles, near Gothland, and the iſle of Bondon off Angermania.

ALCAHEST, *n. s.* an univerſal diſſolvent.

ALCAIC, in ancient poetry, a demomination given to ſeveral kinds of verſe, from Alcæus, their inventor. 1. The firſt kind conſiſts of five feet, viz. a ſpondee, or iambic; an iambic; a cæſura, and two dactyles.—2. The ſecond kind conſiſts of two dactyles and two trochees.—3. Beſides theſe two, which are called *dactylic Alcaics*, there is another ſtyled ſimply *Alcaic;* conſiſting of an epitrite, two choriambus; and a bacchius.

Alcaic ode, an elegant kind of ode compoſed of ſeveral ſtrophes, each conſiſting of four verſes; the two firſt of which are always Alcaics of the firſt kind; the third verſe is a diameter hypercatalectic, conſiſting of four feet and a cæſura; and the fourth verſe is an Alcaic of the ſecond kind.

ALCAID, *n. s.* 1. In Barbary, the governor of a caſtle 2. In Spain, the judge of a city.

ALCAID, **Alcayde**, or **Alcalde**, in the polity of the Moors, Spaniards, and Portugueſe, a magiſtrate, or officer of juſtice, anſwering nearly to the office of a juſtice of peace with us. The Alcaid among the Moors is veſted with the ſupreme juriſdiction, both in civil and criminal caſes.

Alcala de Henarez, a beautiful and extenſive city of Spain, in New Caſtile, ſeated upon the river Henarez, which waſhes its walls 11 miles SW. of Guadalaxara, and 15 E. N. E. of Madrid. The ancient name was complutum. It is built on a very agreeable plain, and is of an oval figure. The ſtreets are handſome and pretty ſtraight. The houſes are well built; and there are ſeveral ſquares, the largeſt of which is an ornament to the city; it is ſurounded on all ſides with piazzas, where tradſemen have their ſhops, and expoſe their goods to ſale, of which there is a great plenty and variety as in moſt towns of Spain. The univerſity, which has gone to decay, was re-eſtabliſhed in 1494, by Cardinal Francis Ximenes; at whoſe charges, and under whoſe directions, the firſt polyglot bible was printed in this town. The land around Alcala is well cultivated, and very fruitful, while that at a diſtance is dry and ſterile; it yields grain in plenty, very good muſcat wine and melons of a delicious kind. Without the walls is a ſpring, the water of which is ſo pure and well taſted, that it is incloſed and ſhut up for the king of Spain's own uſe, from whence it is carried to Madrid. Long. 72, 54. E. Lat. 40, 26. N.

ALCALI, Alcaly, or Alkali. See Chemistry.

ALCAMER, See Alkmaar.

ALCANNA, *n. s.* an Egyptian plant uſed in dying.

Alcanna, in commerce, a coſmetic powder prepared from the leaves of the Egyptian privt, in which the people of Cairo drive a conſiderable trade. It is much uſed by the Turkiſh women to give a golden colour to their nails and hair. There is alſo an oil extracted from the berries of alcanna, and uſed in medicine as a quieſcent.

ALCANTARA, or Valenza de Alcantara, a ſmall but very ſtrong city of Eſtremadura, in Spain, ſeated on the banks of the Tajo, or Tagus, 21 miles from Coria, 25 from Madrid, and 125 from Seville. It lies in a very fruitful ſoil, and is celebrated for its bridge over that river, which was built in the time of the Emperor Trajan, as appears by one of the arches, by the people of Luſitania, who where aſſeſſed to ſupply the expence. It is raiſed 200 feet above the level of the wattr; and though it conſiſts but of ſix arches, is 670 feet in length, and 28 in breadth. At the entrance of the bridge, there is a ſmall antique chapel hewn in a rock by the ancient Pagans, who dedicated it to Trajan, as the Chriſtians did to St. Julian. This city was built by the Moors, on account of the convenience of this bridge, which is at a place where the Tajo is very deep, running between two high ſteep rocks; for this reaſon, they call it *Al-Cantara*, which, in their language, ſignifies *the Bridge*. Long. 69, 53. E. Lat. 39, 20. N.

ALCASAR, a city of Barbary, ſeated about two leagues from Larache, in Aſga, a province in the kingdom of Fez. It was of great note, and the ſeat of the governor of this part of the kingdom; but is now fallen greatly to decay, ſo that of 15 moſques there are only two that they make uſe of. The reaſon, probably, is the bad ſituation of the town; for it ſtands ſo low, that it is exceſſively hot in ſummer, and almoſt overflowed with water in the winter. Here are a great number of ſtorks, who live very familiarly with the people, walking about the town, poſſeſſing the tops of the houſes and moſques without moleſtation; for they eſteem them ſacred birds, and account it ſinful to diſturb them. The baſhaw of Teturi appoints a governor to this town, which is the laſt of his dominions towards Mequinez. Near this city there is a high ridge of mountains, running towards Tetuan, whoſe inhabitants were never brought entirely under ſubjection; and whenever it was attempted, they avenged themſelves by infeſting the roads, and robbing and murdering the travellers. When they were purſued, they retired into their woody mountains, where none could ſafely follow them. Not far from thence is the river Elmahaſſen, famous for the battle fought between Don Sebaſtian king of Portugal, and the Moors; in which the Portugueſe were defeated, and their king ſlain. Long. 62, 25. E. Lat. 35, 15. N.

ALCAVALA, in the Spaniſh finances, was at firſt a tax of 10 per cent. afterwards of 14 per cent. but is at preſent of only ſix per cent. upon the ſale of every ſort of property, whether moveable or immoveable; and it is repeated every time the property is ſold. The levying of this tax requires a multitude of revenue officers ſufficient to guard the tranſportation of goods, not only from one province to another, but from one ſhop to another. It ſubjects not only the dealer in ſome ſorts of goods, but thoſe in all ſorts, every farmer, every manufacturer, every merchant and ſhop-keeper, to the continual viſits and examination of the tax-gatherers. Through the greater part of a country in which a tax of this kind is eſtabliſhed, nothing can be produced for diſtant ſale. The produce of every part of the country muſt be proportioned to the conſumption of the neighbourhood. It is to the alcavala, accordingly, that Uſtaritz imputes the ruin of the manufactures of Spain. He might have imputed to it likewiſe the declenſion of agriculture, as it is impoſed not only upon manufactures, but upon the rude produce of the land.

ALCEA, the Holy-Hock: A genus of the polyandria order, belonging to the monadelphia claſs of plants; and in the natural method ranked under the 37th order, Columniferæ. The characters are: The calyx is a double perianthium, monophyllous and perſiſtent; the exterior one ſix-cleft, the interior half five-cleft: The corolla conſiſts of five petals, coaleſced at the baſe, heart-ſhaped inverſely, and expanding: The ſtamina conſiſts of numerous filaments, coalſced below into a five-cornered cylinder, looſe above, and inſerted into the corolla; the antheræ are kidney-ſhaped: The piſtillum has a roundiſh germen; a ſhort cylindric ſtylus; and numerous briſtly ſtigmata the length of the ſtylus: The pericarpium conſiſts of many arilli, jointed into a verticillum about a columnar depreſſed receptacle: The ſeeds are ſolitary, reniform, and depreſſed. There are two ſpecies, viz.

1. Alcea ficifolia. This plant is a native of Iſtria. Its leaves are cut into ſix or ſeven ſedgments, ſo as to reſemble a hand. Cultivation produces an almoſt infinite variety of this plant, ſuch as double flowered, ſingle flowered, deep red, pale red, blackiſh red, white, purple, yellow, and fleſh-colour.

2. Alcea rosea is a native of China. Its leaves are roundiſh, and cut at their extremities into angles.—Though both ſpecies are natives of warm countries, they are hardy enough to thrive in the open air in Britain, and have for many years been ſome of the greateſt ornaments in their gardens, towards the end of ſummer.

ALCEDO, or Kingsfisher, in ornithology, a genus of the order of picæ. The alceno has a long, thick, triangular bill; with a fleſhy plain, ſhort, flat tongue. Of this genus there are a great many ſpecies, with one or other of which almoſt every part of the world is furniſhed. Moſt of them frequent rivers, and live on fiſh, the ſingularity of catching which is admirable; ſometimes hovering over the water where a ſhoal of ſmall fiſhes is ſeen playing near the ſurface: at other times waiting with attention, on ſome low branch hanging over the water, for the approach of a ſingle one who is ſo unlucky as to ſwim that way; in either caſe dropping like a ſtone, or rather darting with rapidity on its prey; when, ſeizing it croſſwiſe in its bill, it retires to a reſting place to feaſt on it; which it does piecemeal, bones and all, without reſerve, afterwards bringing up the indigeſtible parts in pellets, like birds of prey. The wings of moſt of the genus are very ſhort; yet the birds fly rapidly and with great ſtrength. It may be remarked, that throughout this genus, blue, in different ſhades, is the moſt predominant colour. The ſpecies found in the South Sea Iſlands are held in a kind of ſuperſtitious veneration by the natives of the places they ſeverally inhabit; perhaps on account of their being frequently ſeen flying about the morais or burial places. The jacamars are much allied to this genus, and have been ranked under it by Linnæus. Their toes are, however, differently placed; their food alſo is different, being inſects alone, and not fiſh; and their haunts are different, being moiſt woods, and not ſhores on the banks of rivers. There are above 30 ſpecies of this genus, of which the following are the moſt remarkable: viz.

1. ALCEDO GALBULA, or green jacamar, is about the ſize of a lark. The bill is black, of a ſquare form, a little incurvated and ſharp at the point: the plumage, in general, in the upper part of the body, is of a moſt brilliant green, gloſſed with copper and gold in different lights; the belly, throat, and vent, are rufous; the tail is compoſed of ten feathers, and ſhaped like a wedge; the legs are of a greeniſh yellow, very ſhort and weak; the claws are black. This ſpecies is found both in Guinea and Braſil, in the moiſt woods, which it prefers to the more dry ſpots, for the ſake of inſects, on which it feeds. It is ſeldom ſeen except ſingle; but though theſe birds are ſolitary, they are far from ſcarce, as many may be met with. They are ſaid to have a ſhort and agreeable note. The natives of Guinea call this bird *Venetore*, and the Creoles, *Colibri des grands bois.*

2. ALCEDO ISPIDA, or common kingsfiſher, is not much larger than a ſwallow; its ſhape is clumſy; the bill diſproportionally long; it is two inches from the baſe to the tip; the upper chap black, and the lower yellow. But the colour of this bird atone for its inelegant form: the crown of the head and the coverts of the wings are of a deep blackiſh green, ſpotted with bright azure: the back and tail are of the moſt reſplendent azure; the whole under ſide of the body is orange coloured; a broad mark of the ſame paſſes from the bill beyond the eyes: beyond that is a large white ſpot; the tail is ſhort, and conſiſts of twelve feathers of a rich deep blue; the feet are of a reddiſh yellow, and the three joints of the outmoſt toe adhere to the middle toe, while the inner toe adheres only by one. From the diminutive ſize, the ſlender ſhort legs, and the beautiful colours of this bird, no perſon would be led to ſuppoſe it one of the moſt rapacious little animals that ſkims the deep. Yet it is for ever on the wing, and feeds on fiſh; which it takes in ſurpriſing quantities, when we conſider its ſize and figure. It takes its prey after the manner of the oſprey, balancing itſelf at a certain diſtance above the water for a conſiderable ſpace, then darting into the deep, and ſeizing the fiſh with inevitable certainty. While it remains ſuſpended in the air, in a bright day, the plumage exhibits a beautiful variety of the moſt dazzling and brilliant colours. It makes its neſt in holes in the ſides of the cliffs, which it ſcoops to the depth of three feet; and lays from five to nine eggs, of a moſt beautiful ſemi-tranſprrent white. The female begins to lay early in the ſeaſon, and excludes her firſt brood about the beginning of April. The male, whoſe fidelity exceeds even that of the turtle, brings her large proviſions of fiſh while ſhe is thus employed; and ſhe, contrary to moſt other birds, is found plump and fat at that ſeaſon. The male, that uſed to twitter before this, now enters the neſt as quietly and as privately as poſſible. The young ones are hatched at the expiration of 20 days; but are ſeen to differ as well in their ſize as in their beauty. This bird is found in great numbers in Great-Britain, likewiſe in all other countries of Europe, in Aſia, and alſo in America.

3. ALCEDO PARADISEA, or paradiſe jacamar, is of the ſame ſize with the former, and has a ſimilar bill: the throat, forepart of the neck, and under wing coverts, are white: the reſt of the plumage is of a deep dull green, in ſome lights appearing almoſt black, in others with a ſlight gloſs of violet and copper bronze: the tail is compoſed of 12 feathers of unequal lengths: the two middle ones longeſt; the legs are black; the toes are placed two before and two behind, and pretty much united. It inhabits Surrinam; and like the galbula, it feeds on inſects; and ſometimes, contrary to it, frequents open places. It flies farther at a time, and perches on the tops of trees: it is frequently found with a companion, not being quite ſo ſolitary a bird as the other. It alſo differs in the note, having a kind of ſoft whiſtle often repeated, but not heard a great way off.

4. ALCEDO RUDIS, or Egyptian kingsfiſher, as deſcribed by Haſſelquiſt, is the ſize of the Royſton crow. The bill is blackiſh, more than half an inch broad at the baſe, and two inches in length: the head, ſhoulders, and back, are brown, marked with oblong ferruginous ſpots: the throat is of a ferruginous white: the belly and thighs are whitiſh, marked with longitudinal broadiſh cinerous ſpots: the upper tail coverts quite white: the quills ſpotted with white on the inner webs, chiefly at the tips; the tail is aſh-coloured: the legs are of a pale green; and the claws blackiſh. It inhabits Lower Egypt, about Cairo; builds in ſycamore and date trees, and feeds on frogs, inſects, and ſmall fiſh, which laſt it meets with in the fields when they are overflowed. Its cry is not unlike that of the common crow.

5. ALCEDO TAPARARA of Buffon is about the ſize of a ſtarling. The upper mandible of the bill is black, the lower red: the hind part of the neck, the back, and ſcapulars, are of an elegant blue; the rump and upper tail coverts bright beryl-blue: the under parts of the body are white; the wing coverts blue; and the legs red. It inhabits Cayenne and Guiana, at which laſt place the natives call all the kingsfiſher tribe by the name of *Taparara.* In this part of South America, which contains many rivers full of fiſh, kingsfiſhers, as might be expected, abound in vaſt numbers: but what is moſt remarkable, they never herd together, always being found ſingle, except in breeding time, which is about the month of September. They lay their eggs in the holes of banks, like the kingsfiſher of Europe. The cry of this bird imitates the word *Carac.*

6. ALCEDO TORQUATA, or cinereous kingsfiſher, is about the ſize of a magpie, and 15 inches and a half in length. The bill is three inches and a half long, and brown; the

baſe of the lower mandible reddiſh: the head is creſted: the upper parts of the head and body are bluiſh aſh; the under parts cheſnut: the throat is whitiſh, deſcending down the neck, and paſſing behind like a collar, ending towards the back in a point: the under tail coverts are of a pale fulvous, tranſeverſely ſtriated with black: leſſer wing coverts varied with bluiſh, aſh, black, and yellowiſh: the legs are red; and the claws blackiſh. It inhabits Martinico and Mexico; at which laſt is called *Acbalalactli.* This bird migrates into the northern parts of Mexico at certain ſeaſons only, and is ſuppoſed to come there from ſome hotter parts.

ALCHAMISTER, a chemiſt; an Alchemiſt.

ALCHEMILLA, or LADIES MANTLE: a genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 35th order, Senticoſæ. The calyx is a ſingle-leaved perianthium, tubular, and perſiſtent; the mouth flat, and eight-parted. There is no corolla. The ſtamina conſiſt of four ſmall erect ſubulated filaments placed in the mouth of the calyx; the antheræ are roundiſh: the piſtillum has an egg-ſhaped germen: The ſtylus is filiform, the length of the ſtamina, and inſerted at the baſe of the germ: The ſtigma is globular. There is no pericarpium, but the neck of the calyx cloſed. The ſeed ſolitary, elliptical, and compreſſed. Of this genus there are three ſpecies, viz.

1. ALCHEMILLA ALPINA, or cinque-foil ladies-mantle, with finger-ſhaped ſawed leaves, and greeniſh bloſſoms. It is a native of the mountainous parts of Europe. Goats and cows eat it; horſes, ſheep, and ſwine refuſe it.

2. ALCHEMILLA MINOR, or leaſt ladies-mantle, with five ſmooth leaves growing at a joint and cut into many ſegments. It grows naturally in Sweden, Lapland, and other cold countries. It is eaten by cows and goats; but refuſed by horſes, ſheep, and ſwine.

3. ALCHEMILLA VULGARIS, or common ladies-mantle, with leaves plaited like a fan, and yellowiſh-green bloſſoms. The leaves diſcover to the taſte a moderate aſtringency; and were formerly much eſteemed in ſome female weakneſſes, and in fluxes of the body. They are now rarely made uſe of, though both the leaves and roots might doubtleſs be of ſervice in caſes where mild aſtringents are required. In the province of Smolandia, in Gothland, they make a tincture of the leaves, and give it in ſpaſmodic or convulſive diſeaſes. Horſes, ſheep, and goats, eat it; cows are not fond of it; ſwine refuſe it. All theſe plants have perennial roots, and annual plants.

ALCHEMIST, a practioner in alchemy.

ALCHEMY, that obſolete branch of chemiſtry which had for its principal objects the tranſmutation of metals into gold; the panacca, or univerſal remedy; an alkaheſt, or univerſal menſtruum; an univerſal ferment; and many other things equally ridiculous. The origin and antiquity of *alchemy* are much controverted.—If regard may be had to legend and tradition, it muſt be as old as the flood. But in fact, not one of the ancient poets, philoſophers, or phyſicians, from Homer till 400 years after Chriſt, mention any ſuch thing. The firſt author who ſpeaks of making gold, is Zoſimus the Panopolite, who lived towards the beginning of the fifth century, and who has an expreſs treatiſe, *of the divine art of making gold and silver.* The ruin which has attended this deluſion has occaſioned ſeveral ſtates to make ſevere laws againſt pretences to alchemy. The Romans formerly baniſhed all ſuch as profeſſed it; and the ſacred canons likewiſe directed the thunder of their cenſure againſt them. Diocleſian and Cæſar ordered all books which treated of this ſubject to be burnt. Rymer furniſhes us with a licence for practiſing alchemy, with all kinds of metals and minerals, granted to one Richard Carter, in the year 1746; *Rym. Fæd.* tom. xii. Nevertheleſs, we have had ſevere laws againſt alchemy, and multiplying of metals, as much ſo as againſt coining itſelf.

ALCHIMELIA. See ALCHEMILLA.

ALCHYMICAL, *adj.* relating to alchymy; produced by alchymy.

ALCHYMICALLY, *adv.* in the manner of an alchymiſt; by means of alchymy.

ALCHYMIST, *n. s.* one who purſues or profeſſes the ſcience of alchymy.

ALCHYMY, *n. s.* 1. The more ſublime and occult part of chemiſtry, which propoſes for its object, the tranſmutation of metals, and other important operations.—2. A kind of mixed metal uſed for ſpoons, and kitchen utenſils.

ALCMAER, a city in North Holland. See ALKMAAR.

ALCOHOL, *n. s.* an Arabick term uſed by chemiſts for a high rectified dephlegmated ſpirit of wine, or for any thing reduced into an impalpable powder.

ALCOHOL, or ALKOOL, in chemiſtry, is alſo uſed for any highly rectified ſpirit.—Alcohol is extremely light and inflammable, is a ſtrong antiſceptic, and therefore employed to preſerve animal ſubſtances. See CHEMISTRY.

ALCOHOL, in the Arabian aſtrology, is when a heavy ſlow paced planet receives another lighter one within its orb, ſo as to come in conjunction therewith.

ALCOHOL is alſo uſed for a very fine, impalpable powder, which women in the Eaſt make uſe of. Dr. Shaw, in his Travels, ſpeaking of the women in Barbary, ſays, that none of theſe ladies think themſelves completely dreſſed, until they have tinged their hair, and edges of their eye lids with *al-ka-hol,* the powder of lead ore. From this impalpable powder the name was transferred to other ſubtle powders, and afterwards to ſpirits of wines, exalted to the higheſt purity and perfection.

ALCOHOL MARTIS, filings of ſteel reduced to an impalpable powder, by turning them into ruſt with urine, then levigating and mixing them with water; about a gallon to two pounds and a half of filings; afterwards pouring off the upper part of the water, and evaporating the reſt. Muſgrave has a great opinion of this preparation.

ALCOHOLIZATION, *n. s.* the act of alcoholizing or rectifying ſpirits; or of reducing bodies to an impalpable powder.

To ALCOHOLIZE, *v. a.* 1. To rectify ſpirits till they are wholy dephlegmated.—2. To comminute powder till it is wholly without roughneſs.

ALCOLA is uſed by alchemiſts, for the tartar of urine. It is found in three different forms, viz. 1. Reſolved, or reduced to an impalpable ſubſtance. 2. Sandy, or voided under the appearance of ſmall white grains of whitiſh or reddiſh ſand. 3. Mucilaginous, or viſcous.

ALCOLIZATION, according to Mr. Starkey, denotes the circulation of a volatile ſpirit on a fixed alkali, till ſuch time veſture ſhalt thou change them, and they ſhall be changed' But thou art the ſame, and thy years ſhall have no end. The Koran, therefore, upon a fair examination, far from ſupporting its arrogant claim to a ſupernatural work, ſinks below the level of many compoſitions confeſſedly of human original; and ſtill lower does it fall in our eſtimation, when compared with that pure and perfect pattern, which we juſtly admire in the ſcriptures of truth. It is therefore abundantly apparent, that no miracle either was externally performed for the ſupport, or is internally involved in the compoſition of the Mahometan revelation."

ALCOVE, *n. s.* a receſs, or part of a chamber, ſeparated by an eſtrade, or partition, and other correſpondent ornaments; in which is placed a bed of ſtate, and ſometimes ſeats to entertain company. The word is often uſed for incloſed garden ſeats.

ALD, prefixed to the names of places, ſignifies antiquity, as *Aldborough*, *Aldgate*, &c.

ALDBOROUGH, a ſea-port town in Suffolk, England, which ſends two members to parliament. It is pleaſantly ſituated in the valley of Slaughden, between a hill to the W. on which its old church ſtands; the ſea to the E. and a river running to the S. W. It is a large town, made up of two or three ſtreets of low houſes, running parallel to each other; and was formerly much longer, but the ſea has taken away ſome ſtreets. A quarter of a mile to the S. lies Slaughden, where there is a commodious quay, with ware-houſes for fiſh, and more ſoutherly ſtill, conveniencies for drying them. The fiſhery is the chief employment of the inhabitants, and is conſiderable in the ſeaſon for catching herrings and ſprats; it is the only place in England for curing red ſprats. It is 94 miles N. E. from London, and 40 E. from Bury. Long. 76. 42. E. Lat. 52. 16. N.

ALDBOROUGH, a town in the W. Riding of Yorkſhire, ſeated on the river Ouſe, 15 miles N. W. of York, and 205 N. by W. of London. It ſends two members to parliament. Long. 73. 50. E. Lat. 54. 8. N.

ALDER, in botany. See BETULA.

ALDER, *n. s.* a tree having leaves reſembling thoſe of the hazel; the male flowers, or katkins, are produced at remote diſtances from the fruit, on the ſame tree; the fruit is ſquamoſe, and of a conical figure. The ſpecies are; 1. The common or round-leaved *alder*.—2. The long-leaved *alder*.—3. The ſcarlet *alder*. Theſe trees delight in a very moiſt ſoil. The wood is uſed by turners, and will endure long under ground, or in water.

ALDERMAN, *n. s.* [from *ald*, old, and *man*.] the ſame as ſenator. A governor or magiſtrate, or originally, as the name imports, choſen on account of the experience which his age had given him.

ALDERMAN, in the Britiſh and American policy, an aſſociate to the mayor, or chief civil magiſtrate of a city, for the better adminiſtration of his office. The *aldermen* are an order of magiſtrates, who, in the Engliſh and ſeveral American cities, form a kind of council, and regulate things relative to its policy. They alſo, in ſome places, take cognizance of civil and criminal matters; but that very rarely, and only in certain caſes. The number of theſe magiſtrates is not limited, but is greater or leſs generally in proportion to the magnitude of the place. In London, there are 26; each having one of the wards of the city committed to his care. In the city of New-York, there are ſeven aldermen; in Albany ſix, and in Hudſon four.

ALDERMANLY, *adv.* like an alderman; belonging to an alderman.

ALDERN, *adj.* made of alder.

ALDERNEY, or AURIGNI, an iſland in the Britiſh channel, ſubject to the crown of Great-Britain; though within 6 miles of France, and 30 diſtant from the neareſt part of England. It is about 8 miles in compaſs, and is ſeparate from Cape la Hogue, in Normandy, by a narrow ſtrait, called the *Race of Alderney*, which is a very dangerous paſſage in ſtormy weather, when the two currents meet; otherwiſe it is ſafe, and has depth of water for the largeſt ſhips. The iſland is healthy, fruitful in corn and paſture, remarkable for a fine breed of cows, and contains about 1000 inhabitants. It has but one harbour, called *Crabby*, which is at a good diſtance from the town; and it is only fit for ſmall veſſels. To the weſt lie the range of rocks called the *Caſkets*, ſo dangerous to mariners; where, in 1744, the Victory man of war was loſt. Long. 72. 53. E. Lat. 49. 45. N.

ALDROVANDA, in botany, a genus of the pentandria order, belonging to the pentagynia claſs of plants; of which there is but one ſpecies. The calyx is divided into five parts; the petals are five; and the capſule has five valves, with ten ſeeds. It is a native of Italy, and the Indies; and has no Engliſh name.

ALE, a fermented liquor obtained from an infuſion of malt, differing from beer chiefly in having a leſs proportion of hops. See BREWING. This liquor, the natural ſubſtitute of wine in ſuch countries as could not produce the grape, was originally made in Egypt, the firſt planted kingdom, on the diſperſion from the eaſt, that was ſuppoſed unable to produce grapes. And, as the Noachian colonies pierced further into the weſt, they found, or thought they had found, the ſame defect, and ſupplied it in the ſame manner. Thus the natives of Spain, the inhabitants of France, and the aborigines of Britain, all uſed an infuſion of barley for their ordinary liquor: and it was called by the various names of *Cælia* and *Ceria* in the firſt country, *Cereviſia* in the ſecond and *Curmi* in the laſt; all literally importing only the *ſtrong water*.—" All the ſeveral nations," ſays Pliny, " who inhabit the weſt of Europe, have a liquor with which they intoxicate themſelves, made of corn and water. The manner of making the liquor is ſomewhat different in Gaul, Spain, and other countries, and is called by many various names; but its name and properties are every where the ſame. The people of Spain, in particular, brew this liquor ſo well, that it will keep good a long time. So exquiſite is the cunning of mankind, in gratifying their vicious appetites, that they have thus invented a method to make water itſelf intoxicate." The method in which the ancient Britons, and other Celtic nations, made their ale, is thus deſcribed by Iſidorus and Oroſius. " The grain is ſteeped in water and made to germinate, by which its ſpirits are excited and ſet at liberty; it is then dried and ground; after which it is infuſed in a certain quantity of water; which being fermented, becomes a pleaſant, warming, ſtrengthening and intoxicating liquor." This ale was moſt commonly made of barley; but ſometimes of wheat, oats, and millet.

ALE, BRITISH, VARIOUS KINDS OF. There are various ſorts of ale known in Britain, particularly *pale* and *brown*: the former is brewed from malt ſlightly dried; and is eſteemed more viſcid than the latter, which is made from malt more highly dried or roaſted. Pale ale brewed with hard waters, ſuch as thoſe of pump wells, is judged the moſt wholeſome, as the mineral particles tend to prevent the coheſion of thoſe drawn from the grain, and enable them to paſs the proper ſecretions the better; ſofter waters, as thoſe of rivers, and rain, ſeem better ſuited to draw out the ſubſtance of high dried malts, which retain many igneous particles, beſt abſorbed in a ſmooth vehicle.—Ale is prepared various ways and of various ingredients, as of wheat, rye, millet, oats, barley, the berries of the quick-bean, &c. Some have found that the juice which bleeds from the birch or ſycamore is of great uſe on this occaſion, applied inſtead of water. It makes one buſhel of malt go as far as four in the common way.—Some have a method of preparing ale, ſo that it will keep, carried to the Eaſt or Weſt-Indies. The ſecret is, by maſhig twice with freſh malt; boiling twice; and, after ſhipping it, putting to every five gallons two new-laid eggs whole, to remain therein. It is ſaid, that, in a fortnight's time, the ſhells will be diſſolved, and the eggs become like wind eggs; and that afterwards the white would diſappear, and the yolk remain untouched.

Ale different qualities of. Ale is generally held to be more diuretic than beer, in regard it is ſmoother, more ſoftening, and relaxing; ſo that where urine is to be promoted by facilitating the paſſage, ale is moſt likely to effect it.—Ale is flatulent; and hence ſometimes produces colics, and the cholera morbus: it is aceſcent: but it does not produce calcareous diſeaſes, as has been aſſerted.—If malt liquor, of any degree of ſtrength, is become flat and tartiſh, as it is uſed, it ſhould be drawn out of the caſk into a jug, in which as many drams of powdered chalk is put as there are to be pints of liquor; thus a new ferment will be raiſed, a ſprightly taſte will be reſtored to the liquor, and its acidity will be deſtroyed. Tart liquors of this kind are apt to produce a dyſury, ſtranguary, or a gonorrhea; in which caſes a ſmall quantity of brandy may be taken. The conſumption of ale in Great-Britain and Ireland, is incredible, being computed at about 20 millions of dollars, per annum. The duties on ale and beer form a principal branch of revenue in Britain.

ALEC, in ichthyology, a name given by Gaza, in his commentaries on Ariſtotle, to the fiſh called *mainis*, and by Ovid, *menerela*. It is of the *ſparus* kind.

A-LEE, in the ſea language, a term only uſed when the wind, croſſing or flanking the line of a ſhip's courſe, preſſes upon the maſts and ſails ſo as to make her incline to one ſide which is called the lee-ſide: hence, when the helm is moved over to this ſide, it is ſaid to be *a-lee*, or *hard-a-lee*.

ALEGER, an inferior ſort of vinegar, made of ale, or malt liquor, inſtead of wine.

ALEHOOF, *n. s.* ground ivy, ſo called by the ancient Saxons, as being their chief ingredient in ale.

ALEHOUSE, *n. s.* [from *ale* and *houſe*.] a houſe where ale is publicly ſold: a tipling-houſe.

ALEMANIA, or Allemania, in ancient geography, a name of Germany, but not known before the time of the Antonines, and then uſed only for a part. After the Marcomanni and their allies had removed from the Rhine, a collection of people from all parts of Gaul, as the term *Alemanni*, denotes prompted either by levity or poverty, occupied the Agri, called *Decumates* by Tacitus, becauſe they held them on a tithe; now ſuppoſed to be the duchy of *Wirtemberg*. Such appear to be the ſmall beginnings of Alemania, which was in after times greatly enlarged: but ſtill it was conſidered as a diſtinct part: for Caracalla, who conquered the Alemanni, aſſumed the ſurname both of *Alemannicus* and *Germanicus*.

ALEMANNI, the inhabitants of Alemania, a barbarous people of Germany, who overrun the weſtern empire. See laſt article.

ALEMBIC, *n. s.* a veſſel uſed in diſtilling, conſiſting of a veſſel placed over a fire, in which is contained the ſubſtance to be diſtilled, and a concave cloſely fitted on, into which the fumes ariſe by the heat; this cover has a beak or ſpout, into which the vapours riſe, and by which they paſs into a ſerpentine pipe, which is kept cool by making many convolutions in a tube of water; here the vapours are condenſed, and what entered the pipe in fumes, comes out in drops. Alembics were uſually made of glaſs or copper, and were formerly uſed for diſtillation. The bottom which contained the ſubject for diſtillation, was called, from its ſhape, the *cucurbit*; the upper part, which received and condenſed the ſteam, was called the *head*, the beak being fitted into the neck of a receiver. Retorts, and the common *worm-ſtill*, are now more generally employed.

ALEMETH, or Almon, a city of Judea, in the tribe of Benjamin, ſituated near Anathoth.

ALEMBROTH, [from a Chaldean word ſignifying the *key of art*,] in the writings of the alchemiſts, a word uſed for a ſort of fixed alkaline ſalt, which had the power of the famous alcaheſt in diſſolving bodies, opening the pores of moſt or all known ſubſtances, and thence, as well as by deſtroying ſulphurs, promoting the ſeparation of metals from their ores. It is alſo uſed for a compound of ſal-ammoniac and corroſive ſublimate. Some uſe the term *alembroth deſiccatum*, for ſalt of tartar. See Chemistry.

ALENGTH, *adv.* at full length; along; ſtretched along the ground.

ALEPPO, called by the natives Haleb, and anciently Beroea, is the metropolis of Syria, and next to Conſtantinople and Cairo, in extent, population, and riches; and in buildings inferior to no city in the Turkiſh dominions. It is ſituated 70 miles E. of Scanderoon, on the ſea coaſt, and 175 N. by E. of Damaſcus, in long. 112, 25, E. and lat. 36, 12, N. It is the ordinary reſidence of the pacha, and is ſituated in the vaſt plain which extends from the Orontes to the Euphrates, and which towards the S. terminates in the deſert. It is built on 8 hills; on the higheſt of which the caſtle is erected. This mount is of a conic form, and ſeems to be raiſed with the earth thrown up out of a deep broad ditch which ſurrounds it. The ſuburbs to the N. N. E. are next in height, and thoſe to the W. S. W. are much lower than the parts adjacent, or any other part of the city. The houſes are large and comodious, having terraces on their tops, and generally ſky lights in form of a dome, to let the light into the rooms; which, from their loftineſs, the gilding on the window ſhutters, cupboard doors, &c. have at firſt entrance a very grand and agreeable effect. They are all ſo equal in height, that there are ſeldom any ſteps to aſcend or deſcend, in going from one houſe to another; while ſeveral large vaulted ſtreets increaſe the facility of communication, by affording a paſſage to every part of the city free from the embarraſſment of the open ſtreets. They are carefully paved; have gutters and a foot pavement on each ſide; and the middle of the ſtreets is laid with bricks, with the ſmall ends upwards, for the convenience of the horſes. There is alſo a cleanlineſs obſerved here, unknown to the other cities of Turkey. The moſques are numerous, and ſome of them magnificent. The bazars or market places are long covered narrow ſtreets, on each ſide of which are a great number of ſmall ſhops, juſt ſufficient to hold the tradeſmen and his goods, the buyer being obliged to ſtand without.

ALEPPO, ADVANTAGES AND TRADE OF.—Aleppo, beſides the advantages of a rich and fruitful ſoil, poſſeſſes alſo that of a ſtream of freſh water, which never becomes dry. This rivulet, which is called Heylan, riſes in the mountains of Aentab, and terminates ſix leagues below Aleppo, in a moraſs, full of wild boars and pelicans. Near Aleppo, its banks, inſtead of the naked rocks, which line them in the upper part of its courſe, are covered with a fertile earth,and laid out in gardens, or rather orchards, which, in a hot country, and eſpecially in Turkey, cannot but be delightful. The water is conveyed into the city by an acqueduct, ſaid to have been the work of the empreſs Helena, from whom the river has its name. The city itſelf is one of the moſt agreeable in Syria, and is perhaps the beſt built of any in Turkey. It is the emporium of Armenia and Diarbekar; ſends caravans to Bagdad and Perſia; and communicates with the Perſian gulph and India, by Baſſora, with Egypt and Mecca by Damaſcus, and with Europe by Scanderoon and Latakia. Commerce is there principally carried on by barter. The chief commodities are raw or ſpun cottons, clumſy linens fabricated in the villages; ſilk ſtuffs manufactured in the city; copper, coarſe cloths, goat's hair, gall nuts, the merchandize of India, and piſtachio nuts, of the growth of the neighbourhood. The articles ſupplied by Europe, are the Languedock cloths,cochineal,indigo,ſugar and ſome other groceries. The coffee of America, though prohibited, is introduced, and ſerves to mix with that of Moka. Aleppo is not exceeded in extent by any city in Turkey, except Conſtantinople and Cairo, and perhaps Smyrna. The number of inhabitants has been computed by ſome, at 200,000; by others at 235,000; of whom they ſay, 200,000 are Turks, 30,000 Chriſtirns, and 5000 Jews. But as accurate calculations are hardly to be expected from travellers, and as Aleppo is not larger than Marſeilles,and the houſes conſiſt only of one ſtory, it is probable, that they do not much exceed half that number. The people of this city, both Turks and Chriſtians, are eſteemed the moſt civilized in all Turkey; and the European merchants no where enjoy ſo mnch liberty, or are treated with ſo much reſpect.

ALEPPO, CLIMATE, INHABITANTS, RELIGION, CUSTOMS, &c. OF. The air of Aleppo is very dry and piercing, but at the ſame time very ſalubrious for all who are not troubled with aſthmatic complaints. The city, however, and the environs, are ſubject to a ſingular endemical diſorder, which is called the ring worm or pimple of Aleppo. In fact, a pimple, which is at firſt inflammatory, and at length becomes an ulcer, of the ſize of the nail. The uſual duration of this ulcer is one year; it commonly fixes on the face, and leaves a ſcar, which disfigures almoſt all the inhabitants. It is alledged, that every ſtranger who reſides there three months, is attacked with it; experience has taught, that the beſt mode of treatment is, to make uſe of no remedy. No reaſon is aſſigned for this malady; but M. Volney ſuſpects it proceeds from the quality of the water, as it is likewiſe frequent in the neighbouring villages, in ſome parts of Diarbekar, and even in certain diſtricts near Damaſcus, where the ſoil and the water have the ſame appearances. Of the Chriſtian inhabitants, the greater number are Greeks; next to them, the Armenians, then the Syrians, and laſty, the Maronites; each of whom have a church in the city called Judida; in which quarter, and the parts adjacent, moſt of them reſide. The common language is the vulgar Arabic, but the Turks of condition uſe the Turkiſh. Moſt of the Armenians can ſpeak the Armenian, ſome few Syrians underſtand Syriac, and many of the Jews Hebrew; but ſcarce one of the Greeks underſtand a word of Greek. The people in general are of a middle ſtature, and tolerably well proportioned; but they ſeem neither vigorous nor active. Both ſexes are handſome when young: but the beard ſoon disfigures the men: and the women, as they come early to maturity, alſo fade very ſoon. All the inhatants of both ſexes ſmoke tobacco to great exceſs. Coaches or carriages are not uſed here; therefore perſons of quality ride on horſeback in the city, with a number of ſervants walking before them, according to their rank.

ALEPPO, OLD, anciently called *Chalcis*, is ſituated about 12 miles S. from New Aleppo.

ALERT, *adj.* 1. In the military ſenſe, on guard; watchful; vigilant; ready at a call.—2. In the common ſenſe, briſk; pert; petulant; ſmart; implying ſome degree of cenſure and contempt.

ALERTNESS, *n. s.* the quality of being alert; ſprightlineſs; pertneſs.

ALESSANDRIA. See ALEXANDRIA.

ALET, a town of France, ſeated on the river, and in the department of Aude, 15 miles S. of Carcaſſone, and 37 S. W. of Narbonne. It is remarkable for its baths, and for the grains of gold and ſilver found in the ſtream which runs from the Pyrenean mountains, at the foot of which it ſtands. Long. 77. 25. E. Lat. 42. 59. N.

ALETRIS, in botany, a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 10th order, Coronariæ. The characters are: the corolla is monopetalous, funnel-ſhaped, hexangular, much corrugated, ſemiquinquefid, and perſiſtent; the ſtamina conſiſt of ſix ſubulated filaments, the length of the corolla, and inſerted into the baſe of the diviſions of the corolla; the antheræ are oblong and erect: The piſtillum has an ovate germen; the ſtylus ſubulated, and the length of the ſtamina; the ſtima is trifid: The pericarpium is an ovated capſule, triquetious, pointed and trilocular. The ſeeds are numerous. Of this genus botanical writers enumerate 5 ſpecies; the moſt remarkable of which are the following.

1. ALETRIS CAPENSIS, a native of the Cape of Good Hope. Itſeldom or never flowers in Britain, and will not even outlive the winter unleſs placed in a ſtove.

ALETRIS FARINOSA, a native of Virginia, and other parts of North America. This, though the moſt hardy plant of the genus, requires to be ſheltered under a frame. The flowers appear in June or July, of a whitiſh green colour.

3. ALETRIS FRAGRANS, or tree aloe, is a native of Africa, and, when placed in a ſtove, produces fine ſpikes of white flowers in March or April. By proper management it becomes a ſtately plant, riſing to the height of 12 or 14 feet; the flowers open wide in the evening, and perfume the air of the ſtove. Theſe ſend out one or two heads, or tufts, towards their tops, which may be cut off; and after they have lain a week in the ſtove to heal the wounded parts, they may be planted for increaſe.

ALEVAT, *n. s.* the tub in which the ale is fermented.

ALEWIFE, *n. s.* a woman that keeps an ale-houſe.

ALEXANDERS, in botany. See SMIRNIUM.

ALEXANDER'S FOOT, *n. s.* the name of an herb.

ALEXANDRETTA, by the Turks called *Scanderoon;* a town in Syria, at the extremity of the Mediterranean ſea. It is the port of Aleppo, from which it is diſtant 28 or 30 leagues. It is now, properly ſpeaking, nothing elſe but a village, without walls, in which the tombs are more numerous than the houſes, and which entirely owes its exiſtence to the road which it commands. This is the only road, in all Syria, where veſſels anchor on a ſolid bottom, without their cables being liable to chafe: but in other reſpects it has many inconveniences. It is infeſted during winter, by a peculiar wind, called by the French ſailors *le Raguier*, which, ruſhing from the ſnowy ſummits of the mountains, frequently forces ſhips to drag their anchors ſeveral leagues: And when the ſnow begins to cover the mountains which ſurround the Gulph, tempeſtuous winds ariſe which prevent veſſels from entering for three or four months together. The road alſo to Aleppo by the plain is infeſted by Curd Robbers, who conceal themſelves in the neighbouring rocks, and frequently attack and plunder the ſtrongeſt caravans. But the worſt circumſtance is the extreme unwholeſomeneſs of the air, occaſioned here by ſtagnant waters and mephitic exhalations. It may be affirmed, that this every year carries off one third of the crews of the veſſels which remain here during the ſummer; nay ſhips frequently loſe all their men in two months. The ſeaſon for this epidemic diſorder is principally from May to the end of September: it is an intermitting fever of the moſt malignant kind; and is accompanied with obſtructions of the liver, which terminate in a dropſy. To this baneful epidemic, Alexandretta, from its ſituation, ſeems to be irremediably condemned: for the plain on which the town is built is ſo low and flat, that the rivulets, finding no declivity, can never reach the ſea. When they are ſwelled by the winter rains, the ſea, ſwelled likewiſe by tempeſts, hinders their diſcharging themſelves into it; hence their waters, forced to ſpread themſelves, form lakes in the plain. On the approach of the ſummer, the waters becoming corrupted by the heat, exhale vapours equally corrupt, and which cannot diſperſe, being confined by the mountains that encircle the gulph. The entrance to the bay beſides lies to the W. which in theſe countries is the moſt unhealthy expoſure, when it correſponds with the ſea. The labour neceſſary to remedy this would be immenſe, and after all inſufficient, and indeed, ſuch an undertaking would be abſolutely impoſſible, under a government like that of the Turks. Several years ago, M. Volney informs us, the merchants of Aleppo, diſguſted with the numerous inconveniences of Alexandretta, wiſhed to abandon that port and carry the trade to Latakia. They propoſed to the Pacha of Tripoli, to repair the harbour at their own expence, provided he would grant them an exemption from all duties for ten years. To induce him to comply with their requeſt, the agent they employed talked much of the advantage which would *in time*, reſult to the whole country: "But what ſignifies it to me what may hapen *in time?* replied the Pacha; I was yeſterday at Marach; to-morrow, perhaps, I ſhall be at Djedda: Why ſhould I deprive myſelf of preſent advantages which are certain, for future benefits I cannot hope to partake of?" The European factors were obliged therefore to remain at Scandaroon. There are three of theſe factors, two for the French, and one for the Engliſh and Venetians. The only curioſity they have to amuſe ſtrangers with, conſiſts in ſix or ſeven marble monuments, ſent from England, on which you read: *Here lies ſuch a one, carried off in the flower of his age, by the fatal effects of a contageous air.* The ſight of theſe is the more diſtreſſing, as the languid air, yellow complexion, livid eyes, and dropſical bellies of thoſe who ſhow them, make it but too probable they cannot long eſcape the ſame fate. They have, however, ſome reſource in the village of Bailain, the pure air and excellent waters of which ſurpriſingly reſtore the ſick.

ALEXANDRIA, a city of Lower Egypt, and for a long time its capital; now called *Scanderia.* This city was built by Alexander the Great, ſoon after the overthrow of Tyre, about A. A. C. 333. It is ſituated on the Mediterranean, 12 miles W. of the mouth of the Nile, anciently called *Canopicum;* and lies in Long. 106. 11. E. Lat. 30. 21. N.

ALEXANDRIA, ANCIENT STATE OF. Alexandria was a league and a half long, by one third in breadth, which made the circumference of its walls about four leagues. The lake Mareotis waſhed its walls on the S. and the Mediterranean on the N. It was interſected lengthwiſe by ſtraight parallel ſtreets. This direction left a free paſſage to the northerly wind, which alone conveys coolneſs and ſalubrity into Egypt. A ſtreet of 2000 feet wide began at the gate of the ſea, and terminated at the gate of Canopus, was decorated by magnificent houſes, temples, and public buildings. In this extenſive range, the eye was never tired with admiring the marble, the porphyry, and the obeliſks, which embelliſhed the city. This ſtreet, the handſomeſt in the univerſe, was interſected by another of the ſame breadth, which formed a ſquare at their junction of half a league in circumference. From the middle of this great place, the two gates were to be ſeen at once, and veſſels arriving under full ſail, from the north and ſouth. A mole of a mile in length, ſtretched from the the continent to the iſle of Pharos, and divided the great harbour into two. That which is to the northward has preſerved its name. A dyke drawn from the iſland to the rocks, whereon was built the Pharos, ſecured it from the weſterly winds. The other was called *Ennoſtos*, or the Safe Return. The former is called at preſent the new, the latter the old harbour; a bridge, that joins the mole to the city, ſerved for a communication between them. It was raiſed on lofty pillars ſunk into the ſea, and left a free paſſage for ſhips. The palace, which advanced beyond the promontory of *Locbias*, extended beyond the dyke, and occupied more than a quarter of the city. Each of the Ptolemies added to its magnificence. In the great harbour was the little iſland of Anti-Rhodes, where ſtood a theatre, and a royal place of reſidence. Within the harbour of Eunoſtos was a ſmaller one, called *Kibotos*, which communicated with Lake Mareotis by a canal. Between this canal and the palace was the admirable temple of Serapis, and that of Neptune near the great place where the market was held. Alexandria extended likewiſe along the ſouthern banks of the lake. Its eaſtern part preſented to view the gymnaſium, with its porticoes of more than 600 feet long, ſupported by ſeveral rows of marble pillars. Without the gate of Canopus was a ſpacious circus for the chariot races. Beyond that, the ſuburb of Nicopolis ran along the ſea ſhore, and ſeemed a ſecond Alexandria. A ſuperb amphitheatre was built there with a race ground, for the celebration of the quinquennalia. Such is the deſcription left us of Alexandria by Strabo and other ancient authors.

ALEXANDRIA, BUILDINGS AND LIBRARY OF. The architect employed by Alexander in this undertaking was the celebrated Dinocrates, who had acquired ſo much reputation by rebuilding the temple of Diana at Epheſus. The city was firſt rendered populous by Ptolemy Soter, one of Alexander's captains, who, after the death of the Macedonian monarch, being appointed governor of Egypt, ſoon aſſumed the title of king, and took up his reſidence at Alexandria, about 304 years before Chriſt—In the 30th year of his reign, he made his ſon Ptolemy Philadelphus partner with him in the empire; and by this prince the city of Alexandria was much embelliſhed. In the firſt year of his reign, the famous watch-tower of Pharos was finiſhed. It had been begun ſeveral years before by Ptolemy Soter; and, when finiſhed, was looked upon as one of the wonders of the world. The ſame year, the iſland of Pharos, itſelf, originally ſeven furlongs diſtant from the continent, was joined to it by a cauſeway. This was the work of Dexiphanes, who completed it at the ſame time that his ſon put the laſt hand to the tower. The tower was a large ſquare ſtructure of white marble; on the top of which fires were kept conſtantly burning, for the direction of ſailors. This year alſo was remarkable for bringing the image of Serapis from Pontus to Alexandria. It was ſet up in one of the ſuburbs of the city called Rhacotis, where a temple was afterwards erected to his honour, ſuitable to the greatneſs of that ſtately metropolis, and called, from the god worſhipped there, Serapium. This ſtructure, according to Ammianus Marcellinus, ſurpaſſed in beauty and magnificence all others in the world, except the capitol at Rome.—Within the verge of this temple was the famous Alexandrian library. It was founded by Ptolemy Soter, for the uſe of an academy he inſtituted in this city; and, by continual additions by his ſucceſſors, became at laſt the fineſt library in the world, containing no fewer than 700,000 volumes. One method adopted in collecting books for this library, was, to ſeize all thoſe which were brought into Egypt by the Greeks or other foreigners. The books were tranſcribed in the muſeum by perſons appointed for that purpoſe; the copies were then delivered to the proprietors, and the originals laid up in the library. Ptolemy Euergetes, having borrowed from the Athenians the works of Sophocles, Euripides, and Æſchylus, returned them only the copies, which he cauſed to be tranſcribed in as beautiful a manner as poſſible; preſenting the Athenians at the ſame time with 15 talents (nearly 14,000 dollars) for the exchange.—As the muſeum was at firſt in that quarter of the city called *Bruchion*, near the royal palace, the library was placed there likewiſe; but when it came to contain 400,000 volumes, another library, within the Serapium, was erected by way of ſupplement to it, and on that account called the *daughter* of the former. In this ſecond library, 300,000 volumes, in proceſs of time, were depoſited; and the two altogether contained the 700,000 volumes already mentioned. In the war carried on by Julius Cæſar againſt the inhabitants of this city, the library in the Bruchion, with the 400,000 volumes it contained, was reduced to aſhes. The library in the Serapium, however, ſtill remained; and here Cleopatra depoſited 200,000 volumes of the Pergamean library, which Marc Antony preſented her with. Theſe, and others added from time to time, rendered the new library at Alexandria more numerous and conſiderable than the former; and though it was often plundered during the revolutions and troubles of the Roman empire, yet it was again and again repaired, and filled with the ſame number of books.

ALEXANDRIA, HISTORY OF. This city, as we have already obſerved, ſoon became extremely populous, and was embelliſhed both by its own princes and the Romans; but, like moſt other noted cities of antiquity, hath been the ſeat of terrible maſſacres. About 141 years before Chriſt, it was almoſt totally depopulated by Ptolemy Phyſcon. That barbarous monſter, without the leaſt provocation, gave free liberty to his guards to plunder his metropolis, and murder the inhabitants at their pleaſure. The cruelties practiſed on this occaſion cannot be expreſſed; and the few who eſcaped were ſo terrified that they fled into other countries. Uppon this, Phyſcon, that he might not reign over empty houſes, invited thither ſtrangers from the neighbouring countries; by whom the city was repeopled, and ſoon recovered its former ſplendour. On this occaſion many learned men having been obliged to fly, proved the means of reviving learning in Greece, Aſia Minor, the iſlands of the Archipelago, and other places, where it was almoſt totally loſt. The new inhabitants were not treated with much more kindneſs by Phyſcon than the old ones had been; for, on their complaining of his tyrannical behaviour, he reſolved on a general maſſacre of the young men. Accordingly, when they were one day aſſembled in the gymnaſium, or place of their public exerciſes, he ordered it to be ſet on fire; ſo that they all periſhed, either in the flames, or by the ſwords of his mercenaries, whom the tyrant had placed at all the avenues.—Though Julius Cæſar was obliged to carry on a war for ſome time againſt this city, it ſeems not to have ſuffered much damage except the burning of the library already mentioned. Before Cæſar left Alexandria, in acknowledgment of the aſſiſtance he had received from the Jews, he confirmed all their privileges there, and even engraved his decree on a pillar of braſs. This, however, did not prevent the maſſacre of 50,000 of them in this city about the year of Chriſt 67.—The city of Alexandria ſeems to have fallen into decay ſoon after this, and to have forfeited many of its ancient privileges, though for what offence is not known; but when Adrian viſited Egypt, about the year 141, it was almoſt totally ruined. He repaired both the public and private buildings, not only reſtoring the inhabitants to their ancient privileges, but heaping new favours upon them; for which they returned him their ſolemn thanks, and conferred upon him what honours they could while he was preſent; but as ſoon as he was gone, they publiſhed the moſt bitter and virulent lampoons againſt him. This fickle and ſatirical humour of the Alexandrians was highly diſliked by Adrian, though he inflicted no puniſhment upon them for it; but Caracalla did not let them eſcape ſo eaſily, when they lampooned him. That tyrant, in the year 215, when he viſited their city, having become the ſubject of their fooliſh ſatires, ordered a general maſſacre by his numerous troops, who were diſperſed all over the city. The inhuman orders being given, all were murdered, without diſtinction of age or ſex; ſo that in one night's time the whole city floated in blood, and every houſe was filled with carcaſes. The monſter who occaſioned this had retired during the night to the temple of Serapis, to implore the protection of that deity; and, not yet ſatisfied with ſlaughter, commanded the maſſacre to be continued all the next day; ſo that very few of the inhabitants remained. As if even this had not been ſufficient, he ſtripped the city of all its ancient privileges; ſuppreſſed the academy; ordered all ſtrangers who lived there to depart; and that the few who remained might not have the ſatisfaction of ſeeing one another, he cut off all communication of one ſtreet with another, by walls built for that purpoſe, and guarded by troops left there.—Notwithſtanding this terrible diſaſter, Alexandria ſoon recovered its former ſplendor, as Caracalla was murdered a ſhort time after. It was long eſteemed the firſt city in the world next to Rome; and we may judge of its magnificence, and the multitude of people contained in it, from the account of Diodorus Siculus, who relates, that in his time (44 years before Chriſt) Alexandria had on its rolls 300,000 freemen. Towards the middle of the ſixth century, Amrou *Ebn el Aas*, Omar's general, took it by ſtorm, after a ſiege of 14 months, and with the loſs of 23,000 men. Heraclius, then emperor of Conſtantinople, did not ſend a ſingle ſhip to its aſſiſtance. This prince affords an example very rare in hiſtory; he had diſplayed ſome vigour in the firſt year of his reign, and then ſuffered himſelf to be lulled into indolence and effeminacy. Awakened ſuddenly from his lethargy by the noiſe of the conqueſts of Coſroes, that ſcourge of the eaſt, he put himſelf at the head of his armies, diſtinguiſhed himſelf as a great captain, from his very firſt campaign, laid waſte Perſia for ſeven years, and returned to his capital, crowned with laurels; he then became a theologian on the throne, loſt all his energy, and amuſed himſelf the reſt of his life with diſputing upon Monotheiſm, whilſt the Arabs were robbing him of the fineſt provinces of his empire. Deaf to the cries of the unfortunate inhabitants of Alexandria, as he had been to thoſe of the people of Jeruſalem, who defended themſelves for two years, he left them a ſacrifice to the indefatigable Amrou Ebn al Aas, the Saracen general. All their intrepid youth periſhed with their arms in their hands.

ALEXANDRIA, OPULENT STATE OF, WHEN TAKEN, AND SUBSEQUENT DECAY. The victor, aſtoniſhed at his conqueſt, wrote to the caliph, "I have taken the city of the weſt. It is of immenſe extent. I cannot deſcribe to you how many wonders it contains. There are 4000 palaces, 4000 baths, 12,000 dealers in freſh oil, 12,000 gardeners, 40,000 Jews who pay tribute, 400 comedians," &c. At this time, according to the Arabian hiſtorians, Alexandria conſiſted of three cities, viz. Menna, or the port, which included Pharos, and the neighbouring parts; Alexandria, properly ſo called, where the modern Scanderia now ſtands; and Nekita, probably the Necropolis of Joſephus and Strabo. At that time, John, ſirnamed the Grammarian, a famous Peripatetic philoſopher, being in the city, and in high favour with Amrou, begged of him the royal library. Amrou replied, that it was not in his power to grant ſuch a requeſt; but that he would write to the khalif on that head; ſince, without knowing his pleaſure, he dared not to diſpoſe of a ſingle book. He accordingly wrote to Omar, acquainting him with the requeſt of his friend: To which the ignorant tyrant replied, That if thoſe books contained the ſame doctrine with the Koran, they could be of no uſe, ſince the Koran contained all neceſſary truths; but if they contained any thing contrary to that book, they ought not to be ſuffered; and therefore, whatever their contents were, he ordered them to be deſtroyed. Purſuant to this order, they were diſtributed among the public baths; where, for the ſpace of ſix months, they ſerved to ſupply the fires of thoſe places, of which there was an incredible number in Alexandria. After the city was taken, Amrou thought proper to purſue the Greeks who had fled farther up the country; and therefore marched out of Alexandria, leaving but a very ſlender garriſon in the place. The Greeks, who had before fled on board their ſhips, being appriſed of this, returned on a ſudden, ſurpriſed the town, and put all the Arabs they found therein to the ſword: but Amrou receiving advice of what had happened, ſuddenly returned, and drove them out of it with great ſlaughter; after which the Greeks were ſo intimidated, that he had nothing farther to fear from them. A few years after, however, Amrou being deprived of his government, by the khalif Othman, the Egyptians were ſo much diſpleaſed with his diſmiſſion, that they inclined to a revolt: and Conſtantine, the Greek emperor, having received intelligence of their diſaffection, began to meditate the deſtruction of Alexandria. For this purpoſe, he ſent one Manual, an eunuch, and his general, with a powerful army, to retake that place; which, by the aſſiſtance of the Greeks in the city, who kept a ſecret correſpondence with the imperial forces while at ſea, and joined them as ſoon as they had made a deſcent, he effected, without any conſiderable effuſion of Chriſtian blood. The khalif, now perceiving his miſtake, immediately reſtored Amrou to his former dignity. This ſtep was very agreeable to the natives; who having had experience of the military ſkill and bravery of their renowned general, and apprehending that they ſhould be called to an account by the Greeks, for their former perfidious conduct, had petitioned Othman to ſend him again into Egypt. Upon Amrou's arrival, therefore, at Alexandria, the Copts or natives, with their traitor Al-Mokawkas (who had formerly betrayed to Amrou the fortreſs of Meſr) at their head, not only joined him, but ſupplied him with all kinds of proviſions, exciting him to attack the Greeks without delay. This he did; and, after a moſt obſtinate diſpute, which laſted ſeveral days, drove them into the town, where, for ſome time, they defended themſelves with great bravery, and repelled the utmoſt efforts of the beſiegers. This ſo exaſperated Amrou, that he ſwore, "If God enabled him to conquer the Greeks, he would throw down the walls of the city, and make it as eaſy of acceſs as a bawdy houſe, which lies open to every body." Nor did he fail to execute his menace; for, having taken the town by ſtorm, he quite diſmantled it, entirely demoliſhing the walls and fortifications. The lives of the citizens, however, were ſpared, at leaſt as far as lay in the general's power; but many of them were put to the ſword by the ſoldiers on their firſt entrance. In one quarter particularly, Amrou found them butchering the Alexandrians with unrelenting barbarity; to which, however, by his ſeaſonable interpoſition, he put a ſtop, and on that ſpot erected a moſque, which he called the Moſque of Mercy. From this time, Alexandria never recovered its former ſplendor. It continued under the dominion of the khalifs till the year 924, when it was taken by the Magrebians, two years after its great church had been deſtroyed by fire. This church was called by the Arabs *Al-Kaisaria*, or *Cæsarea;* and had formerly been a pagan temple, erected in honour of Saturn, by the famous queen Cleopatra. The city was ſoon after abandoned by the Magrebians; but in 928, they again made themſelves maſters of it; their fleet being afterwards defeated by that belonging to the khalif, Abul Kaſem the Magrebian general, retired from Alexandria, leaving there only a garriſon of 300 men; of which Thmall, the khalif's admiral, being appriſed, he in a few days appeared before the town, and carried off the remainder of the inhabitants to an iſland in the Nile, called Abukair; (which has, ſince that period, been rendered very remarkable in hiſtory, by the Britiſh under admiral Nelſon, having there engaged, and totally defeated the French fleet, Auguſt 1ſt, 1798.)—This was done to prevent Abul Kaſem from meeting with any entertainment at Alexandria, in caſe he ſhould think proper to return. According to Eutychius, about 200,000 of the miſerable inhabitants periſhed this year.—

Alexandria, prosperity of, *accounted for*. What contributed to raiſe Alexandria to ſuch a prodigious height of ſplendor as it enjoyed for a long time, was its being the centre of commerce between the eaſtern and weſtern parts of the world. It was with the view of becoming maſter of this lucrative trade, that Alexander built this city, after having extirpated the Tyrians, who formerly engroſſed all the Eaſt India traffic. Of the immenſe riches which that trade afforded, we may form an idea, from conſidering that the Romans accounted it a point of policy to oppreſs the Egyptians, eſpecially the Alexandrians; and after the defeat of Zenobia, there was a ſingle merchant of Alexandria who undertook to raiſe and pay an army out of the profits of his trade. The Greek emperors drew prodigious tributes from Egypt, and yet the khalifs found their ſubjects in ſo good circumſtances as to ſcrew up their revenues to 300,000,000 of crowns. Though the revolutions which happened in the government of Egypt, after it fell into the hands of the Mahometans, frequently affected this city to a very great degree; yet ſtill the excellence of its port, and the innumerable conveniences reſulting from the Eaſt India trade, to whomſoever were maſters of Egypt, preſerved Alexandria from total deſtruction, even when in the hands of the moſt barbarous nations. Thus, in the 13th century, when the barbariſm introduced by the Goths, &c. began to wear off from the European nations, and they acquired a taſte for the elegancies of life, the old mart of Alexandria began to revive; and the port, though far from recovering its former magnificence, grew once more famous by becoming the centre of commerce: but having fallen under the dominion of the Turks, and the paſſage round the Cape of Good Hope being diſcovered by the Portugueſe in 1492, a fatal blow was given to the Alexandrian commerce, and the city has ſince fallen into decay.

Alexandria, present state of. The city of Alexandria is reckoned to have at preſent about 14,000 or 15,000 inhabitants; a ſtrange colluvies of different nations, as well as from various parts of the Turkiſh empire. The Britiſh and French carry on a conſiderable commerce with them, and have each a conſul reſiding here. Some Venetian ſhips alſo ſail thither yearly, but with French colours, and under the protection of France. The preſent city is a kind of peninſula ſituated between the two ports. That to the weſtward was called by the ancients the *Portus Eunostus*, now the *Old Port*, and is by far the beſt; Turkiſh veſſels only are allowed to anchor in it: the other called the *New Port*, is for the Chriſtians; at the extremity of one of the arms of which ſtood the famous Pharos. The New Port, the only harbour for the Europeans, is clogged up with ſand, inſomuch that in ſtormy weather ſhips are liable to bilge; and the bottom being alſo rocky, the cables ſoon chafe and part; ſo that one veſſel driving againſt a ſecond, and that againſt a third, they are perhaps all loſt. Of this there was a fatal inſtance, about the year 1773, when 42 veſſels were daſhed to pieces on the mole, in a gale of wind from the N. W. and numbers have been ſince loſt there at different times. If it be aſked in Europe, Why do they not repair the New Port? the anſwer is, That in Turkey they deſtroy every thing, and repair nothing. The old harbour will be deſtroyed likewiſe, as the ballaſt of veſſels have been continually thrown into it for the laſt 200 years. The ſpirit of the Turkiſh government is to ruin the labours of paſt ages, and deſtroy the hopes of future times, becauſe the barbarity of ignorant deſpotiſm never conſiders to-morrow.

Alexandria, ruins of, *described*. The preſent condition of Alexandria is very deſpicable, being now ſo far ruined, that the rubbiſh in many places overtops the houſes. The famous tower of Pharos has long ſince been demoliſhed, and a caſtle, called *Farillon*, built in its place. The cauſeway which joined the iſland to the continent is broken down, and its place ſupplied by a ſtone bridge of ſeveral arches. Some parts of the old walls of the city are yet ſtanding, and preſent us with a maſterpiece of ancient maſonry. They are flanked with large towers, and about 200 paces diſtant from each other, with ſmall ones in the middle. Below are magnificent caſements, which may ſerve for galleries to walk in. In the lower part of the towers is a large ſquare hall, whoſe roof is ſupported by thick columns of Thebaic ſtone. Above this are ſeveral rooms, over which there are platforms more than 20 paces ſquare. The ancient reſervoirs, vaulted with ſo much art, which extend under the whole town, are almoſt entire at the end of 2000 years. Of Cæſar's palace there remain only a few porphyry pillars, and the front, which is almoſt entire, and looks very beautiful. The palace of Cleopatra was built upon the walls facing the port, having a gallery on the outſide, ſupported by ſeveral fine columns. Not far from this palace are two obeliſks, vulgarly called *Cleopatra's Needles*. They are of Thebaic ſtone, and covered with hieroglyphics. One is overturned, broken, and lying under the ſand; the other is on its pedeſtal. Theſe two obeliſks, each of them formed of a ſingle ſtone, are about 60 feet high, by ſeven feet ſquare at the baſe. Towards the gate of Roſetta, are five columns of marble, on the place formerly occupied by the porticoes of the Gymnaſium. The reſt of the colonnade, the deſign of which was diſcoverable 100 years ago by Maillet, has ſince been deſtroyed by the barbariſm of the Turks. But what moſt engages the attention of travellers is the pillar of Pompey, as it is commonly called, ſituated a quarter of a league from the ſouthern gate. It is compoſed of red granite. The capital is Corinthian, with palm leaves, and not indented. The ſhaft and upper member of the baſe are of one piece of 90 feet long, and 9 in diameter. The baſe is a ſquare of about 15 feet on each ſide. This block of marble, 60 feet in circumference, reſts on two layers of ſtone bound together with lead; which, however, has not prevented the Arabs from forcing out ſeveral of them, to ſearch for an imaginary treaſure. The whole column is 114 feet high. It is perfectly well poliſhed, and only a little ſhivered on the eaſtern ſide. Nothing can equal the majeſty of this monument; ſeen from a diſtance, it overtops the town, and ſerves as a ſignal for veſſels. Approaching it nearer, it produces an aſtoniſhment mixed with awe. One can never be tired with admiring the beauty of the capital, the length of the ſhaft, and the extraordinary ſimplicity of the pedeſtal. This laſt has been ſomewhat damaged by the inſtruments of travellers, who are curious to poſſeſs a relic of this antiquity. Learned men and travellers have made many fruitleſs attempts to diſcover in honour of what prince it was erected. The beſt informed have concluded, that it could not be in honour of Pompey, ſince neither Strabo nor Diodorus Siculus have ſpoken of it. The Arabian Abulfeda, in his deſcription of Egypt, calls it *the pillar of Severus*. And hiſtory informs us, that this emperor "viſited the city of Alexandria: That he granted a ſenate to its inhabitants, who, until that time, under the ſubjection of a ſingle Roman magiſtrate, had lived without any national council, as under the reign of the Ptolemies, when the will of the prince was their only law: that he did not confine his benefactions there; he changed ſeveral laws in their favour." This column, therefore, Mr. Savary concludes to have been erected by the inhabitants as a mark of their gratitude to Severus. And in a Greek inſcription, now half effaced, but viſible on the weſt ſide, when the ſun ſhines upon it, and which probably was legible in the time of Abulfeda, he ſuppoſes the name of Severus to have been preſerved. He further obſerves, that this was not the only monument erected to him by the gratitude of the Alexandrians: for there is ſtill ſeen in the midſt of the ruins of Antinoe, built by Adrian, a magnificent pillar, the inſcription on which is ſtill remaining, dedicated to Alexander Severus.

ALEXANDRIA, WATER CISTERNS, CATACOMBS, &c. OF. About 70 paces from Pompey's pillar is the khalis, or the canal of the Nile, which was dug by the ancient Egyptians, to convey the water of the Nile to Alexandria, and fill the ciſterns under the city. On the ſide of the khalis are gardens full of orange and lemon trees, and the fields are full of caper and palm trees. On the top of a hill is a tower, on which a centinel is always placed, to give notice, by means of a flag, of the ſhips that are coming into the port. From this hill may be ſeen, the ſea, the whole extent of the city, and the parts round it. In going along the ſea-coaſt, there is a large baſon cut out of the rock that lines the ſhore. On the ſides of this baſon, two beautiful ſaloons are hewn out by the chiſel, with benches that run acroſs them. A canal made zigzag, for the purpoſe of ſtopping the ſand by its different windings, conveys into them the water of the ſea, as pure and tranſparent as chryſtal. Seated on the ſtone bench, the water riſes a little above the waiſt; while the feet ſoftly repoſe on a fine ſand. The waves of the ſea are heard roaring againſt the rock, and foaming in the canal. The ſwell enters, raiſes you up, and leaves you; and thus alternately entering and retiring, brings a continual freſh ſupply of water, and a coolneſs which is truly delicious under a burning ſky. This place, is vulgarly called the *Bath of Cleopatra*. Some ruins announce that it was formerly ornamented. On the S. W. ſide of the city, at a mile's diſtance, are ſituated the catacombs, the ancient burial places of Alexandria; and altho' they cannot be compared to thoſe of the ancient Memphis, which the Arabs will not permit to be viſited, in order to make the better market of their mummies, it is probable that, the method of embalming being the ſame of the former, theſe catacombs can only differ in their proportions. Baron de Tott in deſcribing theſe, obſerves, "that Nature not having furniſhed this part of Egypt with a ridge of rocks, like that which runs parallel with the Nile above Delta, the ancient inhabitants of Alexandria could only have an imitation, by digging into a bed of ſolid rock; and thus they formed Necropolis, or the "City of the Dead." The excavation is from 30 to 40 feet wide, and 200 long, and 25 deep, and is terminated by gentle declivities at each end. The two ſides, cut perpendicularly, contain ſeveral openings, about 10 or 12 feet in width and height, hollowed horizontally; and which form, by their different branches, ſubterranean ſtreets. One of theſe, which curioſity has diſencumbered of the ruins and ſands that render the entrance of others difficult or impoſſible, contains no mummies, but only the places they occupied. The order in which they were ranged is ſtill to be ſeen. Niches, 20 inches ſquare, ſunk ſix feet horizontally, narrowed at the bottom, and ſeparated from each other by partitions in the rock, 7 or 8 inches thick, divide into checkers the 2 walls of this ſubterranean vault. It is natural to ſuppoſe, from this diſpoſition, that each mummy was introduced with the feet foremoſt into the cell intended for its reception; and that new ſtreets were opened, in proportion as theſe dead inhabitants of Necropolis increaſed." This obſervation, he adds, which throws a light on the catacombs of Memphis, may perhaps, likewiſe explain the vaſt ſize and multitude, as well as the different elevations of the pyramids in the Higher and lower Egypt.

ALEXANDRIA, TAKEN BY THE FRENCH. We ſhall conclude our account of the hiſtory of Alexandria, by obſerving, that when the French undertook the conqueſt of Egypt, in the year 1798, their army, under the command of Bonaparte, arrived before this city on the firſt of July. The former good fortune of this general ſeemed to favour all his firſt efforts, and Alexandria was taken by ſtorm on the night of the fifth following. The French kept poſſeſſion of this place for a ſhort time after they had ſurrendered all the other garriſons in Egypt—But they at laſt capitulated to the Britiſh, under general Hutchinſon about the month of October, 1801. For a particular account of the late hoſtilities in the vicinity of Alexandria and throughout Egypt and Syria, See FRENCH REVOLUTION, HISTORY OF.

ALEXANDRIA, formerly called *Bellhaven*, a city of Virginia, ſituated on the ſouthern branch of the river Potowmac, and now conſtituting a part of the diſtrict of Columbia, which was ceded by Virginia and Maryland to the United States, and by them eſtabliſhed as the ſeat of the general government in the year 1800. The ſituation is elevated and pleaſant, but the ſoil being clayey, the water is ſo bad, that the inhabitants are obliged to ſend nearly a mile for what is drinkable. The original ſettlers anticipating its future growth and importance, laid out the ſtreets on the plan of Philadelphia. In the year 1790, there were about 400 houſes, and 2748 inhabitants; but ſince that time, it has ſo rapidly increaſed, that at preſent, (1802) it moſt probably contains about 700 houſes and 5000 inhabitants; in conſequence of its proximity to the ſeat of the Federal government, and the opening of the navigation of the Potowmac, it bids fair to become, in a ſhort time, one of the moſt thriving commercial cities in the United States. Nine miles below this city, on the Virginia bank of the Potowmac, where it is nearly two miles wide, is Mount Vernon, the celebrated ſeat of the late illuſtrious Waſhington. Alexandria lies in 38. 45. N. Lat. and 2. 10. W. Long. about ſix miles S. W. of the city Waſhington, 60 S. W. of Baltimore, 100 N. of Richmond, Virginia, and 290 from the ſea.

ALEXANDRIAN LIBRARY. See ALEXANDRIA, BUILDINGS AND LIBRARY OF.

ALEXANDRIAN MANUSCRIPT, a famous copy of the Scriptures, conſiſting of 4 volumes, in a large quarto ſize; which contains the whole Bible in Greek, including the Old and New Teſtaments, with the Apocrypha, and ſome ſmaller pieces, not quite complete. This M. S. is now preſerved in the Britiſh Muſeum. It was ſent as a preſent to King Charles I. from Cyrillus Lucaris, patriarch of Conſtantinople, by Sir Thomas Rowe, ambaſſador from England to the Grand Seignior, about the year 1628. Cyrillus brought it with him from Alexandria, where probably it was written. In a ſchedule annexed to it, he gives this account: That it was written, as tradition informed him, by Thecla, a noble Egyptian lady, not long after the firſt council of Nice, which was held in the year 325. But this high antiquity, and the authority of the tradition to which the patriarch refers, have been diſputed; nor are the moſt accurate biblical writers agreed about its age.

ALEXANDRINE, *n. s.* A kind of verſe borrowed from the French, firſt uſed in a poem called *Alexander.* They conſiſt, among the French, of 12 and 13 ſyllables, in alternate couplets; and, among the Engliſh, of 12.

ALEXANDRINES are peculiar to modern poetry, and ſeem well adapted to epic poems. They are occaſionally uſed by moſt nations of Europe; but chiefly by the French, whoſe tragedies are generally compoſed of Alexandrines.

ALEXIPHARMIC, in medicine, expreſſes that property which a remedy, either ſimple or compound, hath to reſiſt or deſtroy every thing of a poiſonous or malignant nature.

ALEXIPHARMIC MEDICINES, in general, contain a great number of volatile parts, and ſuch as render the maſs of blood fluid. The greateſt part of them are aromatic and pungent to the taſte. Among the reſt, it is true, there are ſome acid plants and juices; but theſe are only reckoned in the number, on account of their uſe in malignant and colliquative fevers. Alexipharmics chiefly act by exciting, or increaſing a diaphoreſis or perſpiration; by which the noxious matter is thrown off. See SUDORIFIC.

ALEXIPHARMICS, whether ſimple or compound, are alſo eſteemed preſervatives againſt malignant and peſtilential fevers: but they are to be uſed with caution; ſome of them being only proper in condenſations, and others only in colliquations of the blood. It is dangerous to adminiſter alexipharmics to young people of plethoric habits, without previous evacuations; and Celſus adviſes only to promote a ſweat, when the marks of one approaching are evident.

ALEXIPHARMICS are deemed proper correctors of opium, when it produces ſickneſs, nauſeas, &c. They are alſo ſerviceable in thoſe diſeaſes which proceed from external cold, and obſtructed perſpiration; as catarrhs, rheumatiſms, fluxes, coughs, and glandular tumours. Alexipharmics make a large claſs of medicines; but the principal ones are theſe: 1. Of the animal kingdom, hartſhorn, bezoars, and the bones and teeth of different animals. 2. Of the vegetable kingdom, the leaves and flowers of all the aromatic plants, eſpecially ſuch as are umbelliferous. 3. Of the mineral kingdom, the different preparations of antimony, the dulcified ſpirit of vitriol with alcohol.

ALGÆ, in botany, flags, or flaggers, conſtitute the third order of the 24th claſs. See BOTANY.

A NEW SYSTEM OF ALGEBRA.

INTRODUCTION.

ALGEBRA is one of the principal or fundamental branches of mathematical learning, and as in alphabetical order it makes the firſt mathematical ſyſtem in this work, we ſhall here give a ſhort account of Mathematics in general.

Mathematics comprehend all thoſe arts and ſciences which treat of numbers and magnitude, and are diſtinguiſhed under two general heads. That part which relates to numbers only, is called Arithmetic; and that which regards magnitude, whether it be with reſpect to length, breadth, depth, motion, force, &c. comes under the deſcription of Geometry.

Alſo mathematics are either pure or mixed. Pure, when ſimply applied in inveſtigating and demonſtrating the properties of abſtract numbers and magnitude of all ſorts; and mixed, when applied to particular ſubjects, as Aſtronomy, Geography, Optics, Mechanics, Hydroſtatics, Fortification, Navigation, Gunnery, &c.

In every age and country, where learning has prevailed, the Mathematical Sciences have been eſteemed as poſſeſſing the moſt extenſive and valuable ſhare of human knowledge.

By mathematics we are inſtructed in the purſuit of truth, which alone is the object of knowledge, and evidence is the certain mark or criterion of truth; and this conſiſts in the perception of the agreement or diſagreement of ideas formed in the mind by things natural, according as they themſelves agree or diſagree with each other.

Truth is one, ſimple, uniform, invariable thing; always conſiſtent with itſelf, and wants nothing to commend it but its own native evidence; while its oppoſite falſhood, is infinitely various, inconſiſtent, and contradictory. As truth is what all judicious men admire; and error, what every one hates, that is not blinded, or biaſſed by ſelf-intereſt; ſo the mathematician finds it neceſſary to be cautious not to aſſent to the verity of any premiſes, propoſition, or concluſion, which may attend his enquiries, unleſs the ſame ſhall ſtamp a full and certain conviction in his mind by the force of undeniable evidence. It is evidence alone that can gain his aſſent, or remove his doubts; and when that appears, his mind is charmed; and, having accompliſhed his wiſhes, he deſires nothing further. In mathematics, truth appears eminently conſpicuous, and ſhines in its greateſt luſtre. In other ſciences it is either ſelf-evident (which abates the pleaſure it would otherwiſe contribute to the mind) or elſe it ſo faintly appears under obſcurity, that falſhood is frequently obtruded in lieu thereof; and even truth alone viewed through ſuch a gloomy medium, will hardly be known as ſuch; the mind will remain unſatisfied, and be left in doubts, conjectures, and uncertainties. From this conſideration, and the great utility of the mathematics, we may eſtimate how much they are ſuperior to every other ſpecies of human knowledge.

The manner in which mathematicians proceed is, by firſt laying down as a foundation, certain evident principles, or ſuch as cannot be denied, and from theſe making a gradual progreſs by ſteps ſo connected or linked with each other, and diſpoſed in ſuch order, as will enable the underſtanding to perceive their connection and agreement, and by that means infallibly lead to a true concluſion; for all the parts being as it were locked together by truth, the laſt reſult, though derived from a proceſs of whatever length, muſt be equally true.

By this method, aſſiſted by ſuitable obſervations, mathematicians have penetrated into the depths of knowledge, and as it were into the very receſſes of nature; and have made ſuch extraordinary and unexpected diſcoveries, as have excited the admiration of the world, and filled it with aſtoniſhment.

All that beautiful analogy, and that harmonious connection and conſiſtency, which conſtitutes the quinteſſence of the mathematical ſciences, is loſt in the other ſciences; and, without doubt, this is one main reaſon why greater improvements have been made in theſe, than in all the other ſciences united together.

Oppoſed to true reaſoning, as above deſcribed, is that of falſhood and error; the cauſes of which are various and many; ſuch as the following, viz. the want of faculties or learning; defects of memory; want of due reflection; not rightly connecting the ſeveral ſteps; truſting too much to the ſenſes; giving way to paſſions, appetites, and prejudices imbibed; ſelf-intereſt; errors of education; wrong ſtating the queſtion; not underſtanding the terms; want of proofs; following vulgar received opinions and weak authorities; precipitancy of judgment, &c. But few of theſe intrude on mathematicians. The mathematician watches his proceedings with the moſt ſtrict jealouſy, nor will he draw concluſions but from infallible proofs, or attempt the reſolution of any caſe without ſufficient and proper data.

From mathematics, therefore, the mind reaps theſe general advantages: 1ſt. the accuſtoming of it to attention; for they make the mind attentive by entertaining it with a great variety of truths delightful and evident (though at firſt not obvious); truth being the ſame to the underſtanding as muſic to the ear, or beauty to the eye; only with this ſuperior excellence, that here, the object and faculty are more ſpiritual, the delight more pure, and each free from the regret, turpitude, laſſitude, and intemperance, that too commonly attend ſenſual pleaſures:

2d. Forming in the mind a habit of clear, demonſtrative, and methodical reaſoning. For by accuſtoming themſelves to reaſon cloſely about quantity, we acquire a habit of doing ſo in other things. Geometry and analytics afford the beſt model for imitation to arrive at truth in enquiries of almoſt every kind. Their methods of inveſtigating and demonſtrating truths by definitions of words agreed upon, by ſelf-evident truths, and propoſitions that have been already demonſtrated, is practicable in other ſubjects, though not always to the ſame perfection, the natural defect of evidence in the things themſelves perhaps not admitting of it; but it is always imitable to a very conſiderable degree, and thoſe writers who keep the neareſt to the methods of mathematicians, are the moſt conciſe, intelligent, inſtructive, and free from abſurdities.

It is ſurpriſing to ſee what ſuperficial and inconſequential reaſonings ſatisfy a great part of mankind. A piece of wit, a ſimile, a jeſt, or quotation of an author, paſſes for mighty argument. This weakneſs has made many the ſport of orators, poets, and men of wit. Such looſeneſs and incongruities may indeed afford diverſion to the fancy, but they are not the office of the underſtanding.

3d. Mathematical knowledge adds a manly vigour to the mind, and frees it from prejudice, credulity, and ſuperſtition. This it does two ways, firſt, by accuſtoming us to examine, and not take things upon truſt; ſecond, by giving us a clear and extenſive knowledge of the ſyſtem of the world, and thereby creating in us the moſt profound reverence of the Almighty, and freeing us from theſe mean and narrow thoughts which ignorance and ſuperſtition are apt to beget.

The utility alſo that mathematical ſciences are of in affairs of life is unſpeakable. By mathematics we are enabled to keep juſt and regular accounts, to caſt up, and calculate immenſe ſums, and ſettle all our tranſactions with one another; to meaſure all kinds of ſurfaces and ſolids, and diſtances and altitudes inacceſſible; to divide lands and eſtates; to build houſes, &c. for the convenience and enjoyment of life; to erect fortifications, and make fire-arms and other inſtruments to defend us from enemies; to conſtruct ſhips, and by the help of wind and ſails, and the rules of art, to ſail upon the ocean and traffic with foreign nations; to invent various ſorts of inſtruments for weighing and meaſuring the ſeveral commodities of commerce; to contrive innumerable engines for raiſing and removing bodies of prodigious magnitude; and for various other purpoſes, ſuch as clocks, watches, jacks, pumps, &c. &c. to make dials for regulating time; to deſcribe the ſeveral countries of the earth, and repreſent them by maps, charts, &c. to take account of the ſtars; to meaſure the magnitude and diſtances of the planets, to explain the laws of their motion, and aſcertain the bounds of their courſes; to make proper inſtruments for improving the ſight, and ſo to magnify ſmall bodies which are imperceptible to the naked eye, that they become viſible and conſpicuous, and to cauſe remote inviſible bodies to appear to us large and diſtinct; to aſcertain the ſituation of many great bodies and various ſyſtems of the univerſe; and to admire the wiſdom and omnipotence of that Being who brought them into exiſtence; nay, time would fail in enumerating half the uſes and advantages of mathematical learning. No words can fully expreſs the praiſes of that ſcience which explores not only the earth and ſeas, but alſo the upper regions; declaring, long before they happen, the time of eclipes, and other extraordinary phenomena, of the ſun, moon, ſtars, planets, and comets. Through which alſo we can refer back to various ancient epochas and remarkable events, with preciſion, and thereby rectify the errors of former chronologers and hiſtorians.

The cultivation, therefore, of theſe admirable and ſublime ſciences is a thing of the utmoſt importance, and ought to be conſidered as the principal part of every liberal and well regulated plan of education. They are the guide of our youth, the perfection of our reaſon, and the baſis of every great and noble undertaking. For a further account of the riſe and progreſs of the mathematics, ſee the article MATHEMATICS.

Having ſaid thus much upon mathematics in general, we ſhall return to that particular branch thereof which is the ſubject of this ſyſtem, namely, Algebra.

Algebra is one of the moſt uſeful branches of mathematics, and may be juſtly conſidered as a key to all the reſt. Geometry delights us by the ſimplicity of its principles and the elegance of its demonſtrations: Arithmetic is confined in its object, and partial in its application; but Algebra is general and comprehenſive, and may be ſucceſsfully applied in all poſſible enquiries, where proper data can be eſtabliſhed.

This noble art, however, is by many diſregarded on account of the pretended dryneſs of the ſubject, and the difficulties which ſeem to attend many of its operations. That the fundamental parts of every ſcience are dull and unentertaining, is a truth not to be denied; but then what is obtained with difficulty, is remembered with eaſe; and what is purchaſed with pain, is poſſeſſed with pleaſure. A few years of early and aſſiduous application never fails of procuring us the reward of our induſtry; and who is there that knows the advantages of this great art or ſcience, that would judge his time miſpent, or his labours uſeleſs? It lends its aid to all the other ſciences, and that in their utmoſt perplexities and diſtreſs; when all their own rules and methods fail, when an anſwer to the caſe in hand would be ſought in vain any other way, Algebra, after the moſt ſubtle manner and quick diſpatch, unwinds the clew of difficulties, and furniſhes the artiſt with a theorem ſerving not only for the caſe then before him, but for every other of a ſimilar nature.

Algebra is therefore an art or ſcience which teaches in a general manner to ſolve the moſt difficult problems; and to diſcover and inveſtigate propoſitions and theorems in any particular branch of ſcience, by comparing, with one another, the relation of the abſtract quantities therein concerned.

It is indeed in itſelf an art truly ſublime, and of an unlimited extent; for though the natnre of the ſubject, to which it is applied, ſhould be ever ſo complex; and the quantities concerned ſhould be ever ſo much entangled, yet it affords ſurpriſing means of ſurmounting the utmoſt difficulties, and by a curious and careful purſuit through the moſt intricate labyrinths, of attaining to the anſwer ſought.

In this art letters or ſymbols are ſubſtituted in the place of numbers, by which it obtains an eminent advantage over mere arithmetical operations; becauſe there, the numbers become, as it were, metamorphoſed and changed into others; whereas here, the quantities are preſerved diſtinct, viſible, and unchanged, from which general rules are drawn for anſwering all queſtions of a like nature with that under conſideration.

On account of its extent and uſefulneſs it has been named UNIVERSAL MATHEMATICS, UNIVERSAL ARITHMETIC, and by way of eminence, *Ars Magna*, or the GREAT ART. It is alſo called *Specious Arithmetic*, the *Analytic Art*, &c. And from its wonderful diſpatch and brevity, and uſe of ſymbols, it may likewiſe, with propriety, be termed MATHEMATICAL STENOGRAPHY.

HISTORY.

The firſt inventor of this noble art is not certainly known; however, it is highly probable the ancients had ſome ſort of Analyſis, whereby they found out moſt of their excellent Theorems; for it is hardly poſſible to conceive that they could have hit upon them otherwiſe; and indeed there are ſome examples of it in Euclid, at leaſt in Theon upon Euclid, who ſays that the art was firſt communicated by Plato: and hence Plato is by many eſteemed the inventor. There are alſo inſtances of it in Pappus, and the effects of it are diſcoverable in Archimedes, Appolonius, and others, though they appear to have ſtudiouſly diſguiſed it.

Some aſſert that this art was in uſe among the Arabs much earlier than among the Greeks; and ſuppoſe that the Arabs borrowed it from the Perſians, who alſo, it is conjectured, learned it of the Indians. It is further aſſerted, that it was firſt introduced into Europe by means of an emigration of the Arabs into Spain, about the beginning of the twelfth century; whence many are of opinion, it came into England before Diophantus, (who wrote profeſſedly on the art, about the third century) was known among us. Wherefore M. d'Herbelot, and others, are of opinion, that

Algebra takes its name from Gebar, a celebrated philoſopher, chymiſt, and mathematician, whom the Arabs call Giaber, and who is ſuppoſed to be the inventor. Others from *gofr*, a kind of parchment made of the ſkin of a camel, whereon Ali and Giafer Sadek wrote, in myſtic characters, the fate of Mahometaniſm, and the grand events that were to happen till the end of the world. But others, perhaps with as great probability, derive it form *geber*; a word whence, by prefixing the particle *al*, we have formed *algebra*, which is pure Arabic, and properly ſignifies the reduction of fractions to a whole number. However, the Arabs, it is to be obſerved, never uſe the word *algebra* alone, to expreſs what we mean by it; but always add to it the word *macabelah*, which ſignifies oppoſition and compariſon: thus *algebral-macabelah*, is what we properly call *algebra*. Diophantus's Treatiſe conſiſted of 13 books, 6 of which were tranſlated from Greek into Latin, and publiſhed by Xylander in 1575. He is recorded to be the firſt Grecian who wrote on the ſubject. His works only treat of indeterminate problems.

In 1494, Lucas Pacciolus, or Lucas de Burgo, a Minorite friar, publiſhed at Venice a Treatiſe of Algebra in Italian. This author mentions Leonardus Pſanus, and ſome others, of whom he had learned the art, but we have none of their writings. He eſtabliſhes the received opinion that Algebra came originally from the Arabs, and takes no notice of Diaphantus, which makes it probable that that author's works were not then known in Europe. Pacciolus's Treatiſe goes no farther than Quadratic Equations.

Stefelius, Scipio Ferreus, Cardan, and Tartagilla, ſucceeded each other, and gave ſome ſolutions of Cubic Equations. Next came Bombelli, Nunninus, Romus, Schoner, Salignac, Clavius, and ſome others; but none of them went beyond Quadratics. About the year 1590, Viete publiſhed his ſyſtem of Algebra, wherein he gave an ingenious method of extracting the Roots of Equations by approximation, which has ſince been greatly improved by Newton, Raphſon, Halley, Simpſon, and Emerſon. In 1631, Oughtred and Harriot publiſhed their Treatiſes, both of which were well received.

In 1657, Des Cartes publiſhed his geometry, wherein he made uſe of the literal calculus and the Algebraic rules of Harriot; and as Oughtred in his Clavis, and Marin Ghetaldus, in his books of mathematical compoſition and reſolution, publiſhed in 1630, applied Vieta's Arithmetic to Elementary Geometry, and gave the conſtruction of Simple and Quadratic Equation; ſo Des Cartes applied Harriot's method to the higher Geometry, explaining the nature of Curves by Equations, and adding the Conſtruction of Cubic, Biquadratic, and other higher Equations.

Des Cartes's rule for conſtructing Cubic and Biquadratic Equations, was farther improved by Thomas Baker, in his *Clavis Geometrica Catholica*, publiſhed in 1684; and the foundation of ſuch conſtructions, with the application of Algebra to the Quadratures of Curves, queſtions *de maximis et minimis*, the centrobaryc method of Guildinus, &c. was given by R. Sluſius, in 1668; as alſo by Fermat in his *Opera Mathematica*, Roberval in the *Mem- de Mathem-et de Phyſique*, and Barrow in his *Lect. Geomet.* In 1708, Algebra was applied to the laws of chance and gaming, by R. de Montmort; and ſince by De Moivre and James Bernouilli.

The elements of the art were compiled and publiſhed by Kerſey, in 1671; where the ſpecious Arithmetic and the nature of Equations, are largely explained, and illuſtrated by a variety of examples; the whole ſubſtance of Diophantus is here delivered, and many things added concerning Mathematical compoſition and reſolution from Ghetaldus. The like has ſince been done by Prieſtet in 1694, and by Ozanam in 1705; but theſe authors omit the application of Algebra to Geometry; which defect is ſupplied by Guiſnec, in a French Treatiſe expreſsly on the ſubject publiſhed in 1704, and l'Hopital in his Analytical Treatiſe of the Conic Sections, in 1707.

The immortal Engliſh philoſopher, Sir Iſaac Newton, publiſhed his *Arithmetica Univerſalis* in the year 1707, which abounds in ſelect examples, and contains ſeveral rules and methods invented by the author. Algebra has ſince been applied to a world of knowledge, ſurpaſſing all the wiſdom of the ancients, namely, the conſideration and calculus of infinites, called generally the doctrine of fluxions. It is alſo named *Analysis of Infinites*; and the *Calculus Differentialis*.

Of a modern date, the number of Algebraical authors is almoſt incredible. We muſt, however, with deference to the hoſt, name thoſe whom we think the moſt intelligent and uſeful, viz. Saunderſon, Ward, Simpſon, Emerſon, and Maclaurin; but, as a ſchool-book, the Treatiſe of Bonnycaſtle is well adapted. He is exceedingly methodical, and elegant in his text; and ſo indeed he is in every thing that he has committed to the preſs.

Having, in as brief a manner as we were able, given an hiſtoric view of the riſe and progreſs of this art; we ſhall proceed to ſhew the rudiments thereof, by treating on the ſeveral methods whereby algebraical operations are principally performed.

We are well aware that the application of algebra preſents a wide field to the man of ſcience, as well as to the young artiſt, who thirſts for knowledge; ſo that it becomes neceſſary to obſerve that thoſe voluminous matters cannot be expected within the limits appointed in this Dictionary of Arts and Sciences, eſpecially where unintereſting prolixity is exploded. Notwithſtanding its limits, we are perſuaded the ſtudent will here find the fundamentals of the art ſufficiently treated of, to enable him, in all caſes, to make the application, and to read with pleaſure thoſe authors who have written more extenſively on the ſubject.

SECTION I. DEFINITIONS.

I. As, according to this art, problems are computed by the means of letters and other characters, ſo it is to be obſerved, that the firſt letters of the alphabit, as a, b, c, d, &c. are uſually put for known quantities; and the laſt, as v, x, y, z, for quantities unknown, which are always aſſumed as if they were really given or known, and are thus managed in the proceſs according to the rules of art, till at length either the unknown quantities themſelves, or certain powers or roots thereof, are found equal to ſome given quantities; and ſo they become known alſo.

II. The ſign + *(plus)* denotes *addition*. Thus $a+b$, ſignifies b added to a, This is called a *poſitive* or an *affirmative* ſign; and quantities to be added, are ſtyled *poſitive* or *affirmative* quantities.

III. The ſign — (*minus*) denotes *ſubtraction*. Thus $a—b$, ſignifies b ſubtracted from a. This is called a *negative* ſign; and quantities to be ſubtracted are named *negative* quantities.

IV. Like ſigns are either all +, or all —: Unlike ſigns are + and —.

V. The ſign of *equality* =, is placed between the two quantities to denote them equal. Thus $a=b$, ſhews that a and b, are equal to each other.

VI. ×, is the ſign of *multiplication*. So $a\times b$; $b\times c\times d$, denote the product of a and b, and of b, c, and d, reſpectively: but the product of ſimple quantities is commonly expreſſed by merely joining or annexing the letters; ſo the products of the above quantities are $a\,b$ and $b\,c\,d$. Sometimes the product is denoted by putting a point between each quantity, as $b.\overline{c—d}$ denotes b multiplied by $c—d$.

VII. ÷, is the ſign of *diviſion*. Hence $a\div b$, ſignifies a divided by b; but the ſame is generally written in the manner of a fraction. Thus, $\frac{a}{b}$ and $\frac{a—b}{c+d}$, denote a divided by b, and $a—b$ divided by $c+d$ reſpectively.

VIII. $\backsim$, is put between two quantities to denote their difference; as $a \backsim b$, ſignifies the difference between a and b, but without ſhewing which is the greater or leſs quantity.

IX. $\sqsubset$ or 7 are ſigns of *majority*, and $\sqsupset$ or $\angle$ are ſigns of *minority*. Thus $a \sqsubset b$ ſhews that a is greater than b, and $a \sqsupset b$ ſhews that it is leſs than b.

X. $\surd$, is the ſign of *radicality*, and of itſelf denotes the *ſquare root*. The *cube root*, *biquadrate root*, &c. are expreſſed by writing a 3 or 4, &c. over it. Thus $\surd\, a$, $\sqrt[3]{}\, a$, and $\sqrt[4]{}\, a$, denote the ſquare root, cube root, and biquadrate root of a reſpectively.

XI. The *power of a quantity* is its ſquare, cube, biquadrate, and the figure or letter which is put over a quantity to denote the ſame, is named the *index exponent*, or *dimenſions* of ſuch quantity. Thus a^2, a^3, and a^4, denote the ſquare, cube, and biquadrate of a reſpectively; or, h is the ſame, the ſecond, third, and fourth power of and the figures, 2, 3, and 4, are the indices or expo- ts, &c. of a. Sometimes the power of a quantity is ſhewn by the repetitions of the letter. Thus $a\,a$ is the ſame as a^2, and $a\,a\,a$, the ſame as a^3, &c.

XII. *Like quantities* are thoſe that conſiſt of the ſame , as a, $3a—4a$. Alſo $b\,b$, $3bb—7\,b\,b$; and $2\,a\,b\,c$, $—5\,a\,b\,c$, &c.

XIII. *Unlike quantities* conſiſt of different letters, or of the ſame letters differently repeated; as a, b, $2c$, $—3d$; or as a, $2\,a\,a$, $—5\,a\,a\,a$.

XIV. *Simple quantities* are thoſe which conſiſt of one term only; as $4b$, $3a^2$, $15\,d\,c\,c$, &c.

XV. *Compound quantities* are thoſe which conſiſt of ſeveral terms, as $a+b$, $3a—5c$, $a+2b—3c$, &c.

XVI. A *line* or *vinculum*, drawn over ſeveral quantities a, b, c, &c. denote them to be eſteemed a compound quantity, as $\overline{a+b—c}$.

XVII. The *coefficient* of a quantity is the number prefixed to it; as $5a$, where 5 is the coefficient, and ſignifies that a is multiplied by 5.

XVIII. A *binomial quantity* is one conſiſting of two terms; as $a+b$; a *trinomial*, of three terms, as $a+b+c$; a *quadrinomial*, of four terms, as $a+b+c+d$, &c.

XIX. A *reſidual quantity* is a binomial, where one of the terms is negative.

XX. A *rational quantity* is that which has no rational ſign.

XXI. A *ſurd* is a quantity that has not a proper root, as the ſquare root of b, $(\surd b,)$ the cube root of bb $(\sqrt[3]{bb},)$ &c.

XXII. An *equation* is the mutual comparing of things equal to one another, the ſign of equality being put between them. A dependent Equation is that which may be deduced from ſome others. An Independent Equation cannot be produced from the others. A Pure Equation contains but one power of the unknown quantity, as a *ſimple queſtion*, a *pure quadratic*, a *pure cubic*, &c. An Affected Equation contains ſeveral powers of the unknown quantity, and is denominated according to the higheſt power in it, as an *affected quadratic*, an *affected cubic*, an *affected biquadratic*. Moreover, a Simple Equation contains only the ſimple quantity itſelf; a Quadratic, a quantity of two dimenſions; a Cubic, a quantity of three dimenſions, &c.

Note alſo, that the Roots of Quantities are frequently expreſſed by Fractional Exponents, as $a^{\frac{1}{2}}$ denotes the Square Root of a; $a^{\frac{1}{3}}$, the Cube Root of a; $a^{\frac{1}{4}}$, the Biquadrate Root of a, &c. Alſo $a^{\frac{2}{3}}$ denotes the Cube Root of a^2; $a^{\frac{3}{4}}$ the Biquadrate Root of a^3, &c. Likewiſe :: is the ſign of disjunct Proportion; and $\overset{\cdot}{\underset{\cdot\cdot}{-}}$ of continued proportion, or geometrical Progreſſion.

Theſe explications premiſed, we ſhall lay down the following Axioms, and then proceed to Algebraical Operations.

Axiom. 1. If equal quantities be added to equal quantities, the ſum will be equal. 2. If equal quantities be taken from equal quantities, the remainder will be equal. 3. If equal quantities be multiplied by equal quantities, the products will be equal. 4. If equal quantities be divided by equal quantities, the quotients will be equal. 5. The equal powers or roots of equal quantities are equal. 6. Quantities ſeverally equal to a third quantity are equal to one another. 7. The whole is equal to all its parts taken together.

SECTION II.

PRIMARY ALGEBRAICAL OBSERVATIONS.

Art. I. *To add ſeveral quantities together.*

Rule. 1. If the quantities are like, and have like figures, add together the coefficients, and to the ſum prefix the ſame ſign, ſubjoining the common quantity. 2. If the quantities are like, but have unlike ſigns, take the difference between the ſum of the affirmative coefficients, and the ſum of the negative ones, and thereto prefix the ſign of the greater ſum, annexing alſo the proper quantity. But if the quantities are all unlike, with unlike ſigns, write them down one after another, prefixing to each its proper ſign.

EXAMPLES.

$$\begin{array}{rrr}
12\,ab & 11a^2b+3cd^2 & -25x^2y^3-6x^4 \\
5\,ab & 7a^2b+5cd^2 & -37x^2y\ -8x^4 \\
7\,ab & 10a^2b+7cd^2 & -54x^2y^3-5x^4 \\
\hline
\text{Sum } 24\,ab. & \text{Sum } 28a^2b+15\,cd^2 & \text{Sum}-116x^2y^3-19x^4
\end{array}$$

$$\begin{array}{rr}
-2\,aa-7bcd+dd & +15a-3a+db \\
+7aa-20bcd-dd & -\ 4c^2+ad-5db \\
+3aa+\ 6bcd & +\ dc-5a+d^2 \\
\hline
\text{Sum } +8aa-21bcd & \text{Sum } +15a^2\text{-}4c^2+dc\text{-}8a+ad\text{-}4db+d^2
\end{array}$$

N. B. Where there is no coefficient prefixed to a quantity, it is underſtood that the coefficient is 1; and where there is no ſign prefixed, the quantity is affirmative. The above rule being almoſt ſelf-evident, a further illuſtration is unneceſſary.

ART. II. *To ſubtract Algebraical Quantities.*

Rule. Change the ſigns of the quantities to be ſubtracted, and then add the whole together as in addition.

EXAMPLES.

$$\begin{array}{lrlr}
\text{From} & 5a^2b-cd & \text{From} & 3a^2-2a+cd-d^2-f^2 \\
\text{Take} & -3a^2b+2cd & \text{Take} & -2a^2-5a-3ab-2d^2 \\
\hline
\text{Rem'd.} & 8a^2b-3cd & \text{Rem'd.} & 5a^2+3a+cd+3ab+d^2-f^2
\end{array}$$

This rule requires but little demonſtration, ſince it is eaſy to conceive, that to ſubtract, or take away a decrement, is the ſame as to add an equal increment. If we take away $-b$ from $a-b$, there remains a; and if we add $+b$ to $a-b$, the ſum is likewiſe a. Therefore in *general*, the ſubtracting of a negative quantity is equivalent to the adding of its poſitive value.

ART. III. *To multiply Algebraical Quantities.*

Rule. Multiply each term of the multiplier into every term of the multiplicand, viz. the coefficients into the coefficients, and the letters into the letters, by placing them together like letters in a word; and prefix + to like ſigns, and — to unlike ſigns. The ſum of all will be the product ſought.

EXAMPLES.

$$\begin{array}{lrlrlr}
\text{Multiply} & 3a & \text{Multiply} & -7a^2 & \text{Multiply} & -4cd^2 \\
\text{by} & 5b & \text{by} & -5c^2 & \text{by} & +8a^2 \\
\hline
\text{Product} & 15ab & \text{Product} & +35a^2c^2 & \text{Product} & -32cd^2\,2^2
\end{array}$$

$$\begin{array}{lrlr}
\text{Multiply} & 5a+3b & \text{Multiply} & a^2+ab-b^2 \\
\text{by} & 2a+\ b & \text{by} & a-b \\
\hline
 & 10aa+6ab\qquad\quad & & a^3+a^2b-ab^2\qquad \\
 & +5ab+3bb & & -a^2b-ab^2+b^3 \\
\hline
\text{Prod.} & 10aa+11ab+3bb & \text{Prod.} & a^3\quad *\ -ab^2+b^3
\end{array}$$

SCHOLIUM. That every term of the multiplicand muſt be multiplied by every term of the multiplier is unneceſſary to enlarge upon, being ſimilar to what is practiſed in common arithmetic, and that like ſigns give + and unlike ſigns — in the product, may be proved thus.

I. Let a negative quantity be multiplied by an affirmative one; then, ſince the negative quantity muſt be ſo often taken as there are units in the affirmative quantity, and ſince alſo the ſum of any number of like negatives will be negative, it is plain that in this inſtance the product will be negative. Alſo here, if the multiplicand be made the multiplier, and the multiplier become the multiplicand, that is, if an affirmative quantity be multiplied by a negative one, this implies that the affirmative quantity muſt be ſo often ſubtracted as there are units in the negative one, and the ſum of any number of negatives being negative, it is plain the product in this inſtance alſo will be negative.

II. Let an affirmative quantity be multiplied by an affirmative quantity; now, ſince the former is to be ſo often taken as there are units in the latter, and the ſum of affirmatives is affirmative, in this caſe therefore the product will be affirmative. The concluſion will be the ſame, though the multiplicand be made the multiplier.

III. Let a negative quantity be multiplied by a negative quantity. Here the negative multiplicand is to be ſubtracted as often as there are units in the multiplier; but to ſubtract a quantity having a negative ſign is the ſame as to add that quantity with an affirmative ſign. Therefore the reſult, in this caſe will be affirmative; and it will be the ſame when the multiplicand is made the multiplier, and the multiplier the multiplicand. Therefore *generally*, like ſigns produce *plus*; and unlike ſigns, *minus*.

ART. IV. *To divide one quantity by another*

RULE I. In ſimple quantities which will divide without a remainder, divide the coefficient by the coefficient, and place the anſwer in the quotient, annexing thereto thoſe letters of the dividend which are not found in the diviſor, and obſerving that like ſigns produce +, and unlike ſigns —.

EXAMPLES.

$$\begin{array}{rll}
\text{Diviſor.} & \text{Dividend.} & \text{Quotient.} \\
3ab) & 21abcd & (7cd \\
 & 21abcd & \\
\hline
 & 0 &
\end{array}
\qquad
\begin{array}{rll}
\text{Diviſor.} & \text{Dividend.} & \text{Quotient.} \\
-5a^2b) & 25a^3b^3d & (-5ab^2d \\
 & 25a^3b^3d & \\
\hline
 & 0 &
\end{array}$$

RULE II. In compound quantities, divide the firſt term of the dividend by the firſt term of the diviſor (the quantities being firſt ranged in due order, according to the dimenſions of ſome letter) and place the reſult in the quotient. Multiply the whole diviſor by the quotient, and ſubtract it from the dividend, and repeat the operation as in common arithmetic till the work is done.

EXAMPLES.

$$\begin{array}{rll}
2b-3c) & 38baa-12caa & (4aa \\
 & 8baa-12caa & \\
\hline
 & 0 &
\end{array}
\qquad
\begin{array}{rll}
a+b) & a^2-b^2 & (a-b \\
 & a^2+ab & \\
\hline
 & -ab-b^2 & \\
 & -ab-b^2 & \\
\hline
 & 0 &
\end{array}$$

$$\begin{array}{rll}
3a-b) & 3a^3-12a^2-ba^2+10ab-2b^2 & (2b^2-4a+2b \\
 & 3a^3\qquad\qquad ba & \\
\hline
 & -12a^2\ *+10ab & \\
 & -12a^2\quad+4ab & \\
\hline
 & \qquad+6ab-2b^2 & \\
 & \qquad+6ab-2b^2 & \\
\hline
 & \qquad\quad 0 &
\end{array}$$

SCHOLIUM I. The truth of the Rule, that like ſigns give plus in the quotient, and unlike ſigns minus, will appear

pear from this conſideration, that the diviſor, multiplied by the quotient, muſt always produce the proper dividend; which, upon trial, it will be found, cannot be, but when that rule is ſtrictly obſerved.

Scholium II. It often happens that the diviſor will not exactly divide the dividend, in which caſe it will be proper to place the dividend over the diviſor, in form of a fraction, throwing out ſuch letters as are found in all the terms of the dividend and diviſor. Thus, if the dividend is $ax+x^2$, and the diviſor $ax-x^2$, the quotient will be $\frac{ax+x^2}{ax+x^2}=\frac{a+x}{a-x}$.

It is alſo obſervable, that any power of a quantity is divided by any other power of that quantity, by ſubtracting the exponent of the diviſor from the exponent of the dividend.

Thus $\frac{5a^7}{a^3}=5a^{7-}=5a^4$. And $\frac{16b}{12b^3}=\frac{16b^{1-3}}{12}=\frac{16b^{-2}}{12}$ $\frac{4b^{-3}}{3}$; and this expreſſion is alſo equal to $\frac{4}{3b^2}$; for it is evident, from what has been ſaid, that an affirmative power, in the denominator, makes (if transferred) a negative one he numerator, and conſequently a negative power in the rator, is transferrable to an affirmative one in the denominator.

SECTION III.

OF FRACTIONS, INVOLUTION, & EVOLUTION.

Art. I. *Rules for managing Algebraic Fractions.*

The Rules here are preciſely the ſame as thoſe of Vul- Fractions in Arithmetic, and therefore it would be ſuperfluous to enumerate them, as it is preſumed that thoſe attempt Algebra are at leaſt well verſed in Arithmetical operations; and if in any inſtance the reader ſhould not rfectly recollect them, he will find ample ſatisfaction by eferring to the rules given for fractions in our NEW YSTEM OF ARITHMETIC. However, that there ay not be any defection in the preſent ſyſtem, a few Examples follow by way of exerciſes.

Examp. I. Let $\frac{a}{b}$ be reduced to a fraction, whoſe de- inator is $b-c$. Here $\frac{a}{b}\times\overline{b-c}=a-\frac{ac}{b}$, and $\frac{a-\frac{ac}{b}}{b-c}$ is he fraction required.

Examp. II. Let the mixt quantity $a-\frac{b}{c}$ be reduced o a fraction. Here $\frac{ca-b}{c}$ is the fraction required.

Examp. III. Let $\frac{bd-b^2}{d}$ be reduced to a mixt quantity. Here by dividing $bd-b^2$ by d, the quotient will be b, and he remainder will be $-b$; and therefore the anſwer will e $-\frac{b^2}{d}$.

Examp. IV. What is the greateſt common diviſor of $\frac{d+d^2}{{}^2a+b^2d}$?

Answ. $a+d$, and therefore $\frac{d}{b^2}$ is the fraction in its loweſt terms.

Examp. V. Reduce $\frac{a}{b}$, $\frac{c}{d}$, and $\frac{e}{f}$, to fractions of the ſame value, having one common denominator.

Answ. $\frac{adf}{bdf}$, $\frac{cbf}{bdf}$, and $\frac{edb}{bdf}$ are the fractions required: ſo, in like manner, if it were required to add $\frac{a}{b}$, $\frac{c}{d}$, and $\frac{e}{f}$ together, their ſum would be $\frac{adf+cbf+edb}{bdf}$

In the ſame way the ſum of $\frac{\overline{m+n}^{\frac{a}{c}}}{\overline{d+e}^{2}}$ and $\frac{\overline{d+e}^{2}}{\overline{m+n}^{2}}$ will be found

$$\frac{\overline{m+n}^{\frac{2c+a}{c}}+\overline{d+e}^{2}}{\overline{d+e}^{2}\times\overline{m+n}^{2}}.$$

Alſo $\frac{a+b}{d}-\frac{b^2}{a}=\frac{a^2+ab-b^2d}{ad}$

And $\frac{m}{a^2+bc}-\frac{a^2+bc}{m^2}=\frac{m^3-\overline{a^2+bc}^{2}}{m^2\,a^2+m^2bc}$

Again, $\frac{5x^2}{y^3}$, multiplied by $\frac{4y^5}{3x^4}=\frac{5x^2\times 4y}{3x^4\times y^3}=\frac{20x^2y^5}{3x^4y^3}=\frac{20y^2}{3x^2}$ the product.

And $\overline{\frac{a-b}{cd}}^{\,2}$ divided by $\frac{d^2}{\overline{a-b}^{\,n}}=\frac{\overline{a-b}^{\,n+2}}{cd^4}$. The operations of any other fractions are equally eaſy.

Art. II. *Involution; or to find the Square, Cube, Biquadrate, &c. of any given quantity.*

Rule. Multiply the quantiiy into itſelf as often as the index contains units, leſs one, and the product will be the power required; or, which is equivalent thereto, and in many caſes is more convenient, multiply the index of the quantity by the index of the power, and you will have the anſwer, due regard being had to the ſigns.

Examples.

If a be the Root then	a^2=Square	If $-2a^2b^2$ be the root then	$+4a^4b^4$	=Square
	a^3=Cube		$-8a^6b^6$	=Cube
	a^4=Biquad.		$+16a^8b^8$	=4th Pr.
	a^5=5th Pr.		$-32a^{10}b^{10}$	=5thPr.

$$\begin{array}{l} b+c\ \text{Root}\\ b+c\\ \hline b^2+bc\\ \qquad +bc+c^2\\ \hline b^2+2b^2c+c^2=\text{Square}\\ b+c\\ \hline b^3+2b+bc\\ \qquad b^2c+2bc^2+c^3\\ \hline b^3+3b^2c+3bc^2+c^3=\text{Cube}\end{array}\qquad\begin{array}{l} b-c\ \text{Root}\\ b-c\\ \hline b^2-bc\\ \qquad -bc+c^2\\ \hline b^2\,2b^2c+c^2\ \text{Square}\\ b+c\\ \hline b^3-2b^2c+bc^2\\ \qquad +b^2c+2bc^2-c^3\\ \hline b^3-3b^2c+3bc^2-c^3\ \text{Cube}\end{array}$$

It is obſervable that, in raiſing a binomial, where one of the quantities is negative, as in the inſtance above $b-c$, the terms in every power are + and — alternately. The operation, indeed, is only continued to the 3d power, but the obſervation is univerſal; and even a young beginner in the art, by continuing the multiplication, will eaſily raiſe the quantity to any higher power.

In raiſing trinomials, quadrinomials, &c. it will render the work leſs tedious to divide the root into two parts, taking but one term into one of the parts, and aſſuming ſome other letter in lieu of the reſt; by which means the quantity will be reduced to a binomial, which being raiſed to the required power, the anſwer will be obtained by replacing, inſtead of the aſſumed letter, its proper value.

Thus if $b+c+d$ is to be raiſed to the third power, aſſume $b+c=a$, and ſo the trinomial $b+c+d$ is changed into the binomial $a+d$. Then $\overline{a+d}^3=a^3+3a^2d+3ad^2+d^3=\overline{b+c}^3+3d\times\overline{b+c}^2+3d^2\times\overline{b+c}+d^3$. But $\overline{b+c}^3=b^3+3b^2c+3bc^2+c^3$; and $3d\times\overline{b+c}^2=3d^2\times\overline{b^2+2bc+c^2}=3db^2+6dbc+3dc^2$, alſo $3d^2\times\overline{b+c}=3d^2b+3d^2c$. Therefore $\overline{+cb^3}+3d\times\overline{b+c}^2+3d^2\times\overline{b+c}+d^3=b^3+3b^2c+3bc^2+c^3+3db^2+6dbc+3dc^2+3d^2b+3d^2c+d^3=$ the cube of $b+c+d$, which was to be effected.

In fractional quantities, the numerator and denominator muſt each be involved to the required power, by which a new fraction will be obtained, exhibiting that power of the fraction given.

Thus the 3d Power of $\frac{a^2}{b}=\frac{a^6}{b^3}$; the Square of $\frac{a+b}{d+c}=\frac{a^2+2ab+b^2}{a^2+2dc+c^2}$; the 5th Power of $\frac{a^m}{b^2}\ \frac{c^n}{d^n}$; $=\frac{a^{5m}\,c^{5n}}{b^{10}\,a^5}$; & the n^{th} Power of $\frac{x^{n+1}}{a+b}=\frac{x^{nn+n}}{\overline{a+b}^{\,n}}$

What has been delivered on this head is ſufficient for ſhewing how to involve Algebraic quantities to any Power, whether they are ſimple, compound, or fractional. We cannot, however, cloſe the article without introducing the BINOMIAL THEOREM, which for theſe purpoſes, of all methods, is the moſt uſeful, conciſe, and elegant; and will be a laſting ornament to the name of its renowned inventor, the incomparable Sir ISAAC NEWTON. The Theorem is as follows: Let n denote any number at pleaſure, and let $a+b$ be a binomial, the nth Power thereof will be

$$a^n+na^{n-1}b+n.\frac{n-1}{2}a^{n-2}b^2+n.\frac{n-1}{2}.\frac{n-2}{3}a^{n-3}b^3+n.\frac{n-1}{2}.\frac{n-2}{3}.\frac{n-3}{4}a^{n-4}b^4+n.\frac{n-1}{2}.\frac{n-2}{3}.\frac{n-3}{4}.\frac{n-4}{5}a^{n-5}b^5+n.\frac{n-1}{2}.\frac{n-2}{3}.\frac{n-3}{4}.\frac{n-4}{5}.\frac{n-5}{6}a^{n-6}b^6,$$

&c. the law of continuation being manifeſt. And the nth power of $a-b$ will be expreſſed in the ſame manner, only the ſigns of the 2d, 4th, 6th, &c. terms muſt be negative. The uſe of this Theorem will be evident from the following example.

Let $a+b$ be involved to the 3d power. Here the index is 3, which muſt be placed inſtead of n in the Theorem, and the firſt term will be a^3; the ſecond $a^{3-1}b=3a^2b$; the third $\frac{3\times2}{2}a^{3-2}b^2=3ab^2$; the fourth, $\frac{3\times2\times1}{2\times3}a^{3-3}b^3=b^3$; and the fifth and following terms will be found equal to nothing. Therefore, collecting theſe four terms together, the third power of $a+b$ is $a^3+3a^2b+3ab^2+b^3$.

N. B. The coefficients increaſe till the indices of the two letters a and b become equal or change values. when they return or decreaſe again, after the ſame order, ſo that having found the coefficients of half the term, the reſt become known alſo.

ART. III. *Evolution; or, to find the Roots of given Powers.*

Rule I. In ſimple quantities extract the root of the coefficient for a new coefficient, and divide the index of the letters by the index of the power, and you will have the root ſought.

Thus, the Square Root of $16x=4x^{\frac{2}{2}}=4x$; the Cube Root of $27x^3=3x^{\frac{3}{3}}=3x$; the Square Root of $5a^2x^6=a^{\frac{2}{2}}x^{\frac{6}{2}}\sqrt{5}=ax^3\sqrt{5}$; the Biquadrate Root $81a^4x^8=3a^{\frac{4}{4}}x^{\frac{8}{4}}=3ax^2$; and ſo for any others.

Rule II. To find the Root of Compound Quantities, range the terms after the dimenſions of ſome letter, ſo that the higheſt power thereof may ſtand firſt in order, and the reſt follow according to their ſeveral ranks; then take the root of the firſt term, and place it in the quotient, and, if it be the Square or Cube Root, ſubtract the ſquare or cube thereof from the firſt term, bringing down two or three of the next terms (accordingly as the caſe ſhall be the ſquare or cube root) for a dividend; then proceed to find a diviſor, and in all reſpects to carry on the work agreeably to the rules given for extracting the Square and Cube Roots in our New Syſtem of ARITHMETIC. But if it be the root of a higher power that is wanted, proceed according to the GENERAL RULE for extracting the roots of all powers, as delivered in our ſaid New Syſtem.

EXAMPLES.

Let the Square Root of $36x^4+108x^2+81$ be required.

Operation.

Root.

$$\begin{array}{rl} & 36x^4+108x^2+81\,(6x^2+9 \\ & 36x^4 \\ \hline 12x+9) & +108x^2+81 \\ & +108x^2+81 \\ \hline \end{array}$$

What is the Cube Root of $x^3-6x^2y+12xy^2-8y^3$?

Root.

$$\begin{array}{rl} & x^3-6x^2y+12xy^2-8y^3\,(x-2y \\ & x^3 \\ \hline 8x^2) & -6x^2y+12xy^2-8y^3 \\ & -6x^2y+12xy^2-8y^3 \\ \hline \end{array}$$

What is the ſquare root of $z^2+4xy+4y^2-2xz-4yz+z^2$?

$$\begin{array}{lll} & & \text{Root.} \\ & x^2+4xy+4y^2-2xz-4yz+z^2 & (x+2y-z \\ & x^2 & \\ \hline 2x+2y & \big|\, 4xy+4y^2 & \\ & \big|\, 4xy+4y^2 & \\ \hline 2x+4y-z & \big)\, -2xz-4yz+z & \\ & \big)\, -2xz-4yz+z^2 & \\ \hline \end{array}$$

Note. Here three terms are brought down, which, at firſt ſight, appears rather contrary to the rule; but the reaſon is, the two terms $-2xz$ and $4yz$ are conſidered but as one term, becauſe z in the *ſame power* is found in both of them, and they might have been expreſſed in one term. Thus $-2xz-4yz=-\overline{2x-4y}\times z$; ſo that $-\overline{2x-4y}$ may be conſidered as a coefficient to z.

What is the 4th Root of $16a^4-96a^3b+216a^2b^2-216ab^3+81b^4$?

$$\begin{array}{lll} & & \text{Root.} \\ & 16a^4-96a^3b+216a^2b^2-216ab^3+81b^4 & (2a-3b. \\ & 16a^4 & \\ \hline 32a^3 & \big)\, -96a^3b\, \big(-3b & \\ & \big)\, -96a^3b & \\ & 16a^4-96a^3b+216a^2b^2-216ab\ +81b & \\ \hline \end{array}$$

Scholium. The root may ſometimes be diſcovered by extracting the roots of all the ſimple powers, or terms in the given quantity, and connecting the roots by the ſigns + and —, according as it ſhall appear to agree with the caſe. Thus in the laſt example, the 4th root of $16a^4$ is $2a$, and of $81b^4$ is $3b$, and by connecting them with the ſign —, viz. $2a-3b$, you have the root required.

It is alſo obſervable, that the even root of an affirmative quantity as the 2d, 4th, 6th, &c. may be either + or —; and the odd root of any quantity, as the 3d, 5th, 7th, &c. will have the ſame ſign as the quantity itſelf. The even Root of a negative quantity is impoſſible, for if it had a Root its ſign muſt be either + or —; but all the even powers of any Root, whether affirmative or negative, are affirmative; and therefore no Root involved an even number of times can produce a negative power, and of conſequence a negative power can have no Root.

If a fractional quantity is to be evolved, the roots of the numerator and denominator make the numerator and denominator of the root of ſuch fraction. Thus the Square Root of $\frac{4a^2}{36b^4}=\frac{\sqrt{4a^2}}{36b^4}=\frac{2a}{3b^2}=\frac{a}{3b^2}$; and the Cube Root of $\frac{27a^6}{64x^3}=\frac{\sqrt[3]{27a^6}}{\sqrt{64x^3}}=\frac{3a^2}{4x}$

It frequently happens that the quantity given to be extracted has not a perfect Root, and then the Root is called a Surd; and in that caſe it can be no otherways expreſſed than by either inſerting the quantity with its proper radical ſign, or throwing it into an infinite ſeries. Thus the Square Root of a can be expreſſed no otherways than by $\sqrt{a}$, or $a^{\frac{1}{2}}$; the Cube Root of $b^2=\sqrt[3]{b^2}$ or $b^{\frac{2}{3}}$; the Cube Root of $\frac{a^2b}{c^2}=\sqrt[3]{\frac{a^2b}{c^2}}=\overline{\frac{a\ b}{{}^2b}}\Big|^{\frac{1}{3}}=\frac{a^{\frac{2}{3}}\quad b^{\frac{1}{3}}}{c^{\frac{2}{3}}}$ and the Square Root of $a^2+b^2=\sqrt{a^2+x^2}=$ (by the common rule of extraction) $a+\frac{x^2}{2a}=\frac{x^4}{8a^3}+\frac{x^6}{16a^5}=\frac{5x8}{128a^7}$, &c.

The ſeveral ways of managing Surds will be particularly handled in the next ſection.

SECTION IV. SURD QUANTITIES.

We have ſaid before, that a Surd is the Root of ſuch a quantity as cannot be perfectly extracted: however, it will ſometimes happen in Algebraic operations, that a Root cannot be exhibited in rational quantities, which nevertheleſs is not a Surd in itſelf, but may be perfectly expreſſed in numbers, by ſubſtituting, inſtead of its literal characters, its proper value.

Thus $\sqrt{a^2+x^2}$ cannot be perfectly extracted in algebraic terms; but if the value of a be 3, and the value of x be 4, then $a^2=9$ and $x^2=16$, and the Surd becomes $\sqrt{9+16}=\sqrt{25}=5$; a rational number. Whence a Surd, ſtrictly ſpeaking, is ſuch a quantity as is not commenſurate by the ſcale of rational numbers.

Again, Surds, though incommenſurable with rational quantities, may, notwithſtanding, be commenſurate among themſelves.

Thus $\sqrt{2}$, $3\sqrt{2}$, and $5\sqrt{2}$, are each incommenſurate to any rational number; but, with regard to themſelves, they are in the perfect ratio of their coefficients, 1, 3, and 5, reſpectively. This being premiſed, we ſhall proceed to the Algorithm of Surd Quantities.

Art. I. *To reduce a Rational Quantity to the Form of a Surd.*

Rule. Multiply the index of the quantity by the index of the Surd, and over the quantity ſo produced place the radical ſign, and it will be the form required.

Thus, let 3 be reduced to the form of $\sqrt{5}$. By the Rule $3^{1\times2}$, or $3^2=9$, and $\sqrt{9}$ is the form required.

Again, let a^2 be reduced to the form of $\sqrt[3]{b}$. Here $a^{2\times3}=a^6$, and $a\sqrt[3]{a^6}$ is the required form.

In like manner, $a+b$ reduced to the form of $\sqrt{\overline{cd}}$, is $\sqrt{\overline{a+b}^2}$, or $\sqrt{a^2+2ab+b^2}$; and $\frac{a}{b\sqrt{d}}$ reduced to the form of $\sqrt{c}$, is $\frac{a^2}{b^2d}$

Art. II. *To reduce Quantities of different Indices to other equivalent ones, which ſhall have one given Index.*

Rule. Divide the indices of the quantities by the given Index, and the quotients will be the new indices for thoſe quantities. Then over the ſaid quantities, with their new indices, place the given Index, and they will be the equivalent values required.

Examp. Let $12^{\frac{1}{2}}$ and $9^{\frac{1}{4}}$ be reduced to equal quanſities, having the common Index $\frac{1}{3}$. Here $\frac{1}{2}\div\frac{1}{3}=\frac{3}{2}$= the Index of the firſt quantity; and $\frac{1}{4}\div\frac{1}{3}=\frac{3}{4}$= the Index of the ſecond quantity: therefore $\overline{12^{\frac{3}{2}}}\big|^{\frac{1}{3}}$ and $\overline{9^{\frac{3}{4}}}\big|^{\frac{1}{3}}$ are the quantities required.

Alſo, if $a^{\frac{1}{3}}$ and $b^{\frac{1}{4}}$ are to be reduced to the common Index $\frac{1}{5}$, they will be found $=\overline{a^{\frac{5}{3}}}\big|^{\frac{1}{5}}$ and $\overline{b^{\frac{5}{4}}}\big|^{\frac{1}{5}}$ reſpectively, and ſo for any others.

Art. III. *To reduce Quantities of different Indices, to other equivalent ones, having the least common Index.*

Rule. Reduce the Indices of the given quantities to a common denominator, in the leaſt terms.

Examp. Reduce $a^{\frac{1}{n}}$ and $b^{\frac{1}{m}}$ to the leaſt common Index. Here $\frac{1}{n}$ and $\frac{1}{m}$ reduced to a common denominator, are $\frac{m}{mn}$ and $\frac{n}{nm}$; and therefore $a^{\frac{m}{nm}}$ and $b^{\frac{n}{nm}}$ are the expreſſions required, or, which is the ſame, $\sqrt[nm]{a^m}$, and $\sqrt[nm]{b}$.

Alſo, $\sqrt{a+b}$, and $\sqrt[3]{x^2+y^2}$, will in like manner be found $\overline{a+b}^{\frac{3}{6}}$ and $\overline{x^2+y^2}^{\frac{2}{6}}$, or $\sqrt[6]{\overline{a+b}\big|^3}$ and $\sqrt[6]{\overline{x^2+y^2}\big|^2}$, or, $\overline{3a^3+3a^2b+3ab^2+b^3}\big|^{\frac{1}{6}}$ and $\overline{x^4+2x^2y^2+y^4}\big|^{\frac{1}{6}}$.

Art. IV. *To reduce a Surd to its most simple terms.*

Rule. Divide by the greateſt power contained in it, and place the root before the quotient, with the radical ſign between them.

Thus let $\sqrt{32}$ be reduced to its moſt ſimple terms. Here 16 is the greateſt ſquare number that will divide 32; the diviſion being made the quotient is 2; therefore $4\sqrt{2}$ is the Surd required.

Let $\overline{81a^2b}\big|^{\frac{1}{2}}$ be propoſed. Here, $81a^2$ is the greateſt ſquare; its root is $9a$; and the quotient is b. Therefore $9a\sqrt{b}$ is the Surd in its moſt ſimple terms.

Again, let $\overline{\dfrac{64a^4b^3}{27b-27a}}\Bigg|^{\frac{1}{3}}$ be given. This is $=\overline{\dfrac{64a^3b^3\times a}{27b-27a}}\Bigg|^{\frac{1}{3}}=\dfrac{4ab}{3}\sqrt{\dfrac{a}{b-a}}$; and thus for any other.

Art. V. *To find whether Surds are commensurable or not.*

Rule. Reduce them to the leaſt common index; and the quantities, if fractional, to a common denominator, except when like terms are commenſurable. Then divide them by the greateſt common diviſor, (or by ſuch an one as will give one quotient rational) and if both the quotients are rational, the Surds are commenſurable; but if otherwiſe, they are incommenſurable.

Examp. Let $\sqrt{27}$ and $\sqrt{12}$ be propoſed. Theſe have already one common index, and are equal to $\sqrt{3\times9}$ and $\overline{3\times4}$ reſpectively. Divide by 3, and the quotients are $\sqrt{9}$ and $\sqrt{4}$; that is, 3 and 2; and therefore they are commenſurable.

Again, let $\sqrt{48}$ and $\sqrt{6}$ be propoſed. Here, by dividing by 6, the quotients are $\sqrt{8}$, and $\sqrt{1}$ or 1, and therefore they are incommenſurable.

Alſo, if $\overline{\dfrac{b}{c}}\Bigg|^{\frac{1}{2}}$ and $\overline{\dfrac{c}{b}}\Bigg|^{\frac{1}{4}}$ be propoſed, theſe are reduced to $\overline{\dfrac{b^2}{c^2}}\Bigg|^{\frac{1}{4}}$ and $\overline{\dfrac{c^3}{b^3}}\Bigg|^{\frac{1}{4}}$, and theſe again to $\overline{\dfrac{b^5}{c^2b^3}}\Bigg|^{\frac{1}{4}}$. Divide by $\overline{c^2b^3}^{\frac{1}{4}}$, and the quotients are $\overline{b^5}\Big|^{\frac{1}{4}}$ and $\overline{c^5}\Big|^{\frac{1}{4}}$. Wherefore they are incommenſurable. Furthermore, if $\overline{x^4+x^2y^2}\big|^{\frac{1}{2}}$ and $\overline{x^2y^2+y^4}\big|^{\frac{1}{2}}$ be propoſed, divide theſe quantities by x^2+y^2, and the quotients are $\sqrt{x^2}$ and $\sqrt{y^2}$, or x and y. Hence the quantities are commenſurable. Theſe inſtances are ſufficient to point out the method of performing all other ſimilar caſes.

Art. VI. *To add and subtract Surd Quantities:*

Rule. Reduce quantities with unlike indices into thoſe of like indices, and bring fractions to a common denominator, or elſe to others that have rational denominators or numerators; then reduce the quantities to their ſimpleſt terms, (by Art. IV.) and if the Surd part be the ſame in all, annex it to the Sum or Difference with the ſign (×) of Multiplication.

If the Surd part is not the ſame in all, the quantities can only be added or ſubtracted by connecting them together with the ſigns + or —.

Examp. Let $\sqrt{18}$ and $\sqrt{50}$ be added together. Here $\sqrt{18}=\sqrt{9\times2}=3\sqrt{2}$; and $\sqrt{50}=\sqrt{25\times2}=5\sqrt{2}$, and the ſum $=\overline{3+5}\times\sqrt{2}=8\sqrt{2}=\sqrt{128}$.

Let $\sqrt{4a}$ and $\sqrt[4]{a^6}$ be added. Here $\sqrt{4a}=\sqrt[4]{16a^2}=2\sqrt[4]{a^2}$. And $\sqrt[4]{a^6}=\sqrt[4]{a^4\times a^2}=a\sqrt[4]{a^2}$. Therefore their ſum $=\overline{a+2}\times\sqrt[4]{a^2}=\overline{a+2}\times\sqrt{a}$. In like manner, if it had been required to have ſubtracted $\sqrt{4a}$ from $\sqrt[4]{a^6}$, the remainder would have been $\overline{a-2}\times\sqrt{a}$. Alſo, if $\sqrt[3]{a^2}-\sqrt{a^3}+\sqrt{7}$ is added to $2\sqrt[3]{a^2}+\sqrt{a}\sqrt{3}$, the ſum is $3\sqrt[3]{a^2}-\sqrt{a^3}+\sqrt{7}+\sqrt{a}-\sqrt{^3}$; but if ſubtracted therefrom, the remainder is $\sqrt[3]{a^2}+\sqrt{a}-\sqrt{3}+\sqrt{a^3}-\sqrt{7}$.

If $\sqrt{\frac{2}{3}}$ is added to $\sqrt{\frac{24}{25}}$ the ſum is $\sqrt{\frac{50}{75}}+\sqrt{\frac{72}{75}}=\sqrt{\frac{2\times25}{75}}+\sqrt{\frac{2\times36}{75}}=5\sqrt{\frac{2}{75}}+6\sqrt{\frac{2}{75}}=\overline{5+6}\times\sqrt{\frac{2}{75}}=11\sqrt{\frac{2}{75}}$; but if ſubtracted, the remainder is $\overline{6-5}\times\sqrt{\frac{2}{75}}=\sqrt{\frac{2}{75}}$. The procedure is the ſame for any other quantities.

Art. VII. *To multiply and divide Surds.*

Rule. Reduce the Surds to the ſame index; and the product or quotient of the rational quantities being annexed to the product or quotient of the Surds, will give the product or quotient required.

Examp. Let $2\sqrt{2}$ be multiplied by $3\sqrt{3}$. Here the Surds have already the ſame index. Therefore $7\times 3\times\sqrt{\overline{2\times 3}}=6\sqrt{6}$ is the product required. Let $a^{\frac{1}{3}}$ be multiplied by $b^{\frac{1}{4}}$. Here $a^{\frac{1}{3}}=\overline{a^4}\big|^{\frac{1}{12}}$, and $b^{\frac{1}{4}}=\overline{b^3}\big|^{\frac{1}{12}}$; and their product is $\overline{a^4b^3}\big|^{\frac{1}{12}}$.

Let $x^{\frac{1}{2}}+2y^{\frac{1}{3}}$ be multiplied by $5yx^{\frac{1}{2}}$. Here $x^{\frac{1}{2}}$ (the firſt term) $\times\ {}_5\,yx^{\frac{1}{2}}=\overline{1\times 5y}\times\sqrt{\overline{xx}}=5y\ x$; alſo the ſecond term $+2y^{\frac{1}{3}}=2\sqrt[6]{y^2}$ and $5yx^{\frac{1}{2}}=5\sqrt[6]{y^6\ x^3}$, and their product $=+\overline{2\times 5}\times\sqrt[6]{\overline{y^2\times y^6\ x^3}}=+10\sqrt[6]{\overline{y^8\ x^3}}$, and therefore the whole product is $5yx+10\sqrt[6]{\overline{y^8\ x^3}}$. If both quantities are compound, the operation will be equally eaſy, due regard being paid as well to the inſtructions of **Art.** III. as to the rule here given.

Let $a-a\sqrt{x}$ be multiplied by $b-b\sqrt{x}$. Here the product by b is $ab-ab\sqrt{x}$; and the product by $-b\sqrt{x}=-ab\sqrt{x}\times abx$, and their ſum is $ab-2ab\sqrt{x}+abx$, the anſwer ſought.

So in diviſion, if $z^{\frac{1}{2}}$ be divided by $y^{\frac{1}{3}}$, the quotient will be $\frac{\overline{z^3}}{y^2}\Big|^{\frac{1}{6}}$; alſo $\frac{3x^{\frac{1}{n}}y^{\frac{1}{m}}}{4a}$ divided by $\frac{2y^2\,x^{\frac{1}{3}}}{5b}$ $\frac{5b\times 3}{4a\times 2}\frac{\sqrt[mn]{\overline{x^my^n}}}{\sqrt[3]{\overline{y^6\ x}}}$

$$\frac{15}{8}\frac{b}{a}\times\sqrt[3mn]{\frac{x^{3m}\ y^{3n}}{y^{6mn}\ x^{mn}}}$$

; and the like for any other; obſerving, in compound quantities, to divide each term in the dividend by the whole diviſor, and connect the quotients with the ſigns + or —, as the caſe ſhall be; and further, that the dividing of each ſeparate term by the compound diviſor, is the ſame as multiplying it by the reciprocal thereof.

Thus, if any ſingle term, as $x^{\frac{1}{2}}$ is divided by a compound term, as $x^{\frac{1}{3}}+y^{\frac{1}{2}}$, it is the ſame thing as if it was multiplied by $\overline{x^{\frac{1}{3}}+y^{\frac{1}{2}}}^{\,1}$, and therefore the quotient is

$$\frac{\overline{x^3}}{x^2+y^3}\Bigg|^{\frac{1}{6}}$$

N. B. A fraction is changed into its reciprocal by making the numerator the denominator, and the denominator the numerator.

Scholium. With regard, however, to compound Surds, it will not often happen that any advantage can be derived by the above mode of proceeding. Wherefore it will be proper to try to carry on the diviſion in the ſame form as was ſhewn for compound rational quantities, which ſometimes may be done with great facility. When this fails, the quotient can only be expreſſed by writing the diviſor under the dividend in manner of a fraction.

Art. VIII. *Involution and Evolution of Surd Quantities,*

Are performed by multiplying (if it is a ſimple Surd) the index of the Quantity by the index of the power to which it is to be involved, or by the fraction expreſſing the Root to whi h it is to be evolved, and where there is a rational part, its proper Power or Root muſt be prefixed thereto.

Thus, the Square of $a\sqrt{x}=a^2\times x^{\frac{1}{2}\times 2}=a^2\times x^{\frac{2}{2}}=a^2\times x^1=a^2x$. The Cube of $a\sqrt{x}^{\frac{5}{2}}=a^3\times x^{\frac{5}{2}\times 3}=a^3\times x^{\frac{15}{2}}=a^3x^{\frac{15}{2}}$, or $a^3\sqrt{x^{15}}$.

Alſo the Cube Root of $\overline{a+x}^{\frac{1}{2}}=\overline{a+x}^{\frac{1}{2}\times\frac{1}{3}}=\overline{a+x}^{\frac{1}{6}}$; and the Biquadrate Root of $81x^{\frac{2}{3}}=^{\frac{2}{3}\times\frac{1}{4}}=3x^{\frac{2}{12}}=x^{\frac{1}{6}}$, or $3\sqrt[6]{x}$.

Scholium. Here no difference is made between Roots and Powers, ſave that the indices of Powers are whole numbers, but thoſe of Roots, fractions.

Hence, in many caſes, both Involution and Evolution may be performed at one operation. For inſtance, if it is required to involve $\overline{a+x}^{\frac{1}{4}}$ to the 5th Power, and then to extract the Cube Root thereof, it will be done at once, by multiplying the exponent $\frac{1}{4}$ by $\frac{5}{3}$; and ſo the anſwer is $\overline{a+x}^{\frac{5}{12}}$

Therefore the indices of the Powers and Roots, thus entangled, may with propriety be deemed fractional powers; and hence in *general*, $x^{\frac{v}{r}}$ raiſed to the $\frac{n}{m}$th power is $x^{\frac{v}{r}\times\frac{n}{m}}=x^{\frac{v\,n}{r\,m}}$.

Compound Surds are involved and extracted as integers or rational quantities, due regard being had to the operations of Simple Surds.

In caſes of Evolution, where the Root of Compound Surds cannot be found, it muſt be denoted by a line or vinculum drawn over the whole, together with the proper radical ſign or index.

Operations of theſe kinds may be much facilitated by aſſuming, inſtead of Surds, ſome rational quantities or letters to repreſent them; and by having recourſe to the Binominal Theorem, given in Art. II. Sect. III, where n may be taken to denote any power, either whole or fractional; and ſo it may be made applicable to caſes of Evolution as well as Involution; and having by this means, obtained the terms of the required power (which, if fractional, will commonly be an infinite ſeries) the Surds may be reſtored in lieu of the aſſumed letters, obſerving to raiſe the Indices of the Surds in each term of the Power denoted to the Indices of their ſubſtitutes.

It was obſerved in Art. II. Sect. III. that when the quantity to be involved is a reſidual, viz. when one of the terms is negative, as $a-b$, the terms of any power thereof will be + and — alternately; and in Binominals, where both the terms are negative; that all the terms, of whatever power, will be affirmative: this, however, is to be underſtood within this limit, namely, when the power of the quantity to be involved is affirmative.

When the power is negative, as $\overline{a+b}\rceil^{-n}$, or $\overline{a-b}\rceil^{-n}$; in the firſt caſe, all the terms in the odd places will be affirmative, and thoſe in the even places negative; but in the latter caſe, all the terms will be affirmative.

N. B. A quantity with a negative power is equal to its reciprocal with an affirmative power. Thus $\overline{a\underline{+}b}\rceil^{-n}=\frac{1}{\overline{a+b)}\underline{n}}$

This follows from what was obſerved in Scholium of Article IV. Sect. II.

SECTION V. OF INFINITE SERIES.

Art. I. *To find the value of a Fraction in an infinite Series.*

Rule. Divide the numerator by the denominator, as in common diviſion, and continue the operation as far as ſhall be thought neceſſary. In many caſes, after a few terms are had in the quotient, the law by which it converges will be diſcovered, and ſo any number of terms be ſupplied at pleaſure.

Examples.

Let $\frac{1}{1+x^2}$ be thrown into an infinite ſeries,

$$\begin{array}{l}
1+x^2\,)\,1\quad(1-x^2+x^4-x^6+x^8-\&c.\\
\quad\underline{1+x^2}\\
\quad -x^2\\
\quad\underline{-x\ \ -x^4}\\
\qquad\quad +x^4\\
\qquad\quad\underline{+x^4+x^9}\\
\qquad\qquad\quad -x^6\\
\qquad\qquad\quad\underline{-x^6-x^8}\\
\qquad\qquad\qquad\quad +x^8\\
\qquad\qquad\qquad\quad\underline{+x^8+x^{10}}\\
\qquad\qquad\qquad\qquad\quad -x^{10}
\end{array}$$

Let $\frac{ax}{a-x}$ be expreſſed by an infinite ſeries.

$$\begin{array}{l}
a-x\,)\,a\,x\,\left(\ x+\frac{x^2}{a}+\frac{x^3}{a^2}+\frac{x^4}{a^3},\ \&c.\right.\\
\quad\underline{ax-x^2}\\
\qquad +x^2\\
\qquad\underline{+x^2-\frac{x^3}{a}}\\
\qquad\qquad +\frac{x^3}{a}\\
\qquad\qquad\underline{+\frac{x^3}{a}-\frac{x^4}{a^2}}\\
\qquad\qquad\qquad +\frac{x^4}{a^2}\\
\qquad\qquad\qquad\underline{+\frac{x^4}{a^2}-\frac{x^5}{a^3}}\\
\qquad\qquad\qquad\qquad +\frac{x^5}{a^3}
\end{array}$$

In both theſe ſeries, after a few terms are found, the law of continuation is manifeſt.

Scholium. It will, however, ſometimes be difficult to come at the ſeries by this mode, by reaſon of the coefficients; and then it will be convenient to aſſume a ſeries with unknown coefficients to repreſent it; which being multiplied or involved, as the queſtion requires, and the quantities of the ſame dimenſion being put equal to each other, Equations will be had, from which the coefficients may be eaſily determined. But this will be better underſtood after we have treated of Equations; wherefore though we ſhall give an inſtance of it here, the reader may paſs over this, and the remaining part of the Section, till he knows perfectly how to manage Equations.

The method is this: Suppoſe $\frac{1}{a-x}$ be the given quantity. Let the aſſumed ſeries be $A+Bx+Cx^2+Dx^3+Ex^4$, &c. $=\frac{1}{a-x}$. Multiply both by $a-x$, and there will be

$$\begin{array}{l}
1=aA+aBx+aCx^2+aDx^3+aEx^4,\ \&c.\\
\qquad -Ax-Bx^2-Cx^3-Dx^4,\ \&c.
\end{array}$$

and by equating the coefficients of the ſame powers of x, $aA=1$, $aB-A=o$, $aC-B=o$, $aD-c,=o$, $aE-D=o$, &c. Hence in the firſt equation, $A=\frac{1}{a}$; in the ſecoud, $B=\frac{A}{a},=\frac{1}{a^2}$; in the 3d, $C=\frac{B}{a}=\frac{1}{a^3}$; in the 4th, $D=\frac{C}{a}=\frac{1}{a^4}$; and in the like manner $E=\frac{1}{a^5}$ Therefore $\frac{1}{a-x}$ brought to a ſeries is $\frac{1}{a}+\frac{x}{a^2}+\frac{x^2}{a^3}+\frac{x^3}{a^4}+\frac{x^4}{a^5}+$, &c.

Art. II. *To involve an infinite Series to any given Power.*

Rule. Subſtitute the particular letters or numbers in the given ſeries inſtead of thoſe in the following general form.

$$\begin{array}{l}
\overset{m}{z}+:\overline{a+bx+cx^2+dx^3+ex^4}\rceil^{m}=\overset{m}{z}\ \overset{m}{+}\ \text{into}\\
\qquad\qquad +a^m\\
\qquad\qquad +\frac{mbA}{a}.x\\
\qquad\qquad +\frac{2mcA+\overline{m-1}.bB}{2a}.x^2\\
\qquad\qquad +\frac{3m\,dA+\overline{2m-1}.\,cB+\overline{m-2}.bC}{3a}.x^3\\
\qquad\qquad +\frac{4meA+\overline{3m-1}.dB+\overline{2m-2}cC+\overline{m-3}.bD}{4a}.x^4\\
\qquad\qquad +\frac{5mfA+\overline{4m-1}.eA+\overline{3m-2}.dC+2m\text{[illegible]}D\times\overline{m-4}bE}{5a}.x^5\\
+\ \&c.\ \&c.\ \&c.
\end{array}$$

where A, B, C, D, E, &c. are the coefficients of the terms immediately preceding thoſe wherein they firſt appear; and the law of continuation is evident.

Examp. Required the ſquare of $1+x+x^2+x^3+x^4+$, &c. Here $z=1$, $a=1$, $b=1$, $c=1$, $d=1$, &c. and $m=2$, which values being put in the general ſeries in lieu of the letters, it becomes $1+\frac{2A}{1}x+\frac{4A+B}{2}x^2+\frac{6A+3B+0}{3}x^3+\frac{8A+5B+2C-D}{4}x^4$, &c. Then the firſt term A, being 1, the 2d is $2x$, and B, its co-efficient is 2; the 3d term is $3x^2$, and C, its co-efficient is 3; and ſo on for the reſt. And the ſquare of the given ſeries is $1+2x+3x^2+4x^3+5x^4$, &c. If it was required, inſtead of ſquaring the ſeries, to extract the ſquare root thereof, the proceſs would be juſt the ſame, only m inſtead of being $=2$, would be $=\frac{1}{2}$, and in that caſe the ſeries would become $1+\frac{1}{2}Ax+\frac{A-\frac{1}{2}B}{2}x^2+\frac{A+0-C}{3}x^3+\frac{2A+\frac{1}{2}B-C-\frac{1}{2}D}{4}x^4$ &c. and hence, $1+\frac{1}{2}x+\frac{3}{8}x^2+\frac{5}{16}x^3+\frac{35}{128}x^4$, &c.

Various examples might have been given to have illuſtrated this rule, but it is apprehended the above is ſufficient to ſhew its general uſe.

Art. III. *To revert an infinite Series; or, to find the Root of such a Series.*

Rule I. If the ſeries conſiſt of all the powers of z, as $Az+Bz^2+Cz^3+D4^4+Ez^5$, &c. $=y$, then ſubſtitute the values of the co-efficients, A, B, C, D, &c. in the following form, for the root.

$$z=\frac{1}{A}y-\frac{B}{A^3}y^2+\frac{2BB-AC}{A^5}y^3+\frac{5ABC-A^2D-5B^3}{A^7}y^4$$
$$+\frac{14B^4-21AB^2C+6A^2BD+3A^2C^2-A^3E}{A^9}y^5$$
$$+\frac{-42B^5+8A^4B^5C-28A^5B^2D-28A^5BC+7A^3BE\quad 7A^3CD-A^4F}{A^{11}}y^6, \text{\&c.}$$

For put $z=ay+by^2+cy^3\quad+by^4$, &c. Then

$$\begin{aligned}
zz &= aay^2+2aby^3+bby^4, \text{ \&c.}\\
&\qquad\qquad\qquad\;\, +2ac,\\
z^3 &= \qquad\quad a^3y^3+3a^2by^4, \text{ \&c.}\\
z^4 &= \qquad\qquad\qquad a^4y^4, \text{ \&c.}
\end{aligned}$$

&c. Whence

$$\left.\begin{aligned}
Az &= Aay+Aby^2+Acy^3\quad+Ady^4, \text{ \&c.}\\
+Bz^2 &= \qquad Ba^2y^2+2Baby^3+Bbby^4, \text{ \&c.}\\
&\qquad\qquad\qquad\qquad\quad +2Bac\\
+Cz^3 &= \qquad\qquad Ca^3y^3+3Ca^2by^4, \text{ \&c.}\\
+Dz^4 &= \qquad\qquad\qquad\qquad Da^4y^4, \text{ \&c.}
\end{aligned}\right\}=y.$$

&c.

Then making the homologous powers equal, $Aay=y$, and $a=\frac{1}{A}$ And $Ab+Ba^2=0$, or $b=\frac{-B}{A^3}$. Likewiſe $Ac+2Bab+Ca^3=0$, and $c=\frac{2BB-AC}{A^5}$. In like manner $Ad+Bbb+2Bac+3Ca^2b+Da^4=0$, whence $D=\frac{5ABC-A^2D-5B3}{A^7}$; and ſo on.

Examp. Let $z=x+\frac{xx}{2}+\frac{x^3}{3}+\frac{x^4}{4}+\frac{x^5}{5}$, &c. to find x in a ſeries of z. Here $z=x$, $y=z$. $A=1$, $B=\frac{1}{2}$, $C=\frac{1}{3}$, $D=\frac{1}{4}$, $E=\frac{1}{5}$, &c. and $x=\frac{1}{1}z-\frac{1}{2}z^2=\frac{\frac{1}{2}\quad\frac{1}{3}}{}z^3+\frac{5\times\frac{1}{6}-\frac{1}{4}-5\times\frac{1}{8}}{1}z^4$, &c. $=z-\frac{1}{2}z^2+\frac{1}{6}z^3-\frac{1}{24}z^4+\frac{1}{120}z^5$, &c. $=z-\frac{zz}{1.2}+\frac{z^3}{2.3}-\frac{z^4}{2.3.4}+\frac{z^5}{2.3.4.5}$, &c. that is, $x=z-\frac{z}{2}A-\frac{z}{3}B-\frac{z}{4}C-\frac{z}{5}D$, &c. where A, B, C, &c. are the foregoing terms with their ſigns.

Rule II. If the ſeries conſiſts of the odd powers of z, as $Az+Bz^3+Cz^5+Dz^7$, &c. $=y$, ſubſtitute the values of the co-efficients A, B, C, &c. into the following form, which will give the root.

$$z=\frac{1}{A}y-\frac{B}{A^4}y^3+\frac{3BB-AC}{A^7}y^5+\frac{8ABC-A^2D-12B^3}{A^{10}}y^7+$$
$$\frac{55B^4 55AB^2C+10A^2BD+5A^2C^2-A^3E}{A^{13}}y^9, \text{\&c.}$$

For put $z=ay+by^3+cy^5+dy^7$, &c. Then

$$\begin{aligned}
z^3 &= a^3y^3\quad 3a^2by^5+3a^2cy^7\\
&\qquad\qquad\qquad\quad 3abb\\
z^5 &= \qquad\quad a^5y^5\quad 5a^4by^7\\
z^7 &= \qquad\qquad\qquad\quad a^7y^7
\end{aligned}$$

&c.

$$\left.\begin{aligned}
\text{And } Az &= Aay+Aby^3+Acy^5+Ady^7, \text{ \&c.}\\
+Bz^3 &= \qquad Ba^3y^3+3Ba^2by^5+3Ba^2cy^7\\
&\qquad\qquad\qquad\qquad\quad +3Babb\\
+Cz^5 &= \qquad\qquad\quad Ca^5y^5\;\;+5Ca^4by^7\\
+Dz^7 &= \qquad\qquad\qquad\qquad +Da^7y^7
\end{aligned}\right\}=y.$$

Then equating the co-efficients of like terms; $Aa=1$, $Ab+Ba^3=0$, $Ac+3Ba^2b+Ca^5=0$, $Ad+3Ba^2c+3Babb+5Ca^4b+Da^7=0$, &c. whence $a=\frac{1}{A}$, $b=-\frac{Ba^3}{A}=-\frac{B}{A4}$. Likewiſe $c=\frac{3BB-AC}{A^7}$, $d=\frac{8ABC-A^2D-12B^3}{A^{10}}$ &c.

Examp. Suppoſe $y+\frac{y^3}{2.3dd}+\frac{8y^5}{2.4.5d^4}+\frac{3.5y^7}{2.4.6.7d^6}+$&c.

$=a$, to find y. Here $z=y$, $y=a$, $A=1$, $B=-\frac{1}{2.3dd}$, $C=\frac{3}{2.4.5.d^4}$, $D=\frac{3.5}{2.4.6.7d^6}$, &c. Then $y=a-\frac{1}{2.3dd}a^3+\overline{\frac{1}{2.2.3d^4}-\frac{3}{2.4.5d^4}}\times a+\overline{\frac{1}{2.5}-\frac{5}{2.4.2.7}-\frac{1}{2.3.3}}\times\frac{a^7}{d^6}$, &c.

$$=a-\frac{1}{2.3dd}a^3+\frac{1}{2.3.4.5d^4}a^5-\frac{1}{2.3.4.5.6.7d^6}a^7, + \&c.$$

Rule III. When the ſeries conſiſt of any powers, of z denoted by m and n, as $Az^{m}+Bz^{m+n}+Cz^{m+2n}+Dz^{m+3n}+Ez^{m+4n}$, &c. $=y$, then ſubſtitute the values of the co-efficients, A, B, C, &c. into this form, for the root or value of z.

$$\text{Put } v=\frac{y}{A}\text{ Then } v=v^{\frac{1}{m}}-\frac{B}{mA}v^{\frac{1+n}{m}}+\frac{\overline{m+1+2n}BB-2mAC}{2mmAA}v^{\frac{1+2n}{m}}$$

$$\left.\begin{array}{c}\frac{\overline{2mm+9mn+9nn+3m+6n+1}}{6m^3A^3}B^3\\ +\frac{\overline{m+3n+1}}{mmA^2}BC\\ \frac{D}{-mA}\\ \&c.\end{array}\right\}v^{\frac{1+3n}{m}}$$

For put $z=v^{\frac{1}{m}}+bv^{\frac{1+n}{m}}+cv^{\frac{1+3n}{m}}+dv^{\frac{1+3n}{m}}+$, &c. Then dividing the given ſeries by A, we have $z^{m}+\frac{B}{A}z^{m+n}+\frac{C}{A}z^{n+2n}$ &c. $=\frac{y}{A}=v$. Whence by involution,

$$\left.\begin{array}{l}z^{m}=v+mbv^{\frac{m+n}{m}}+\begin{array}{c}mc\\ +m\frac{m-1}{2}bb\end{array}v^{\frac{m+2n}{m}}, \&c.\\ \frac{B}{A}z^{m+n}=\frac{B}{A}\times: v^{\frac{m+n}{m}}+\overline{m+n}\,bv^{\frac{m+2n}{m}}\ \&c.\\ \frac{C}{A}z^{m+2n}=\frac{C}{A}\times: v^{\frac{m+2n}{m}}\ \&c.\\ \frac{D}{A}z^{m+3n}=, \&c,\end{array}\right\}=v$$

Then equating the co-efficients, $mb+\frac{B}{A}=0$, and $b=\frac{-B}{mA}$.

And $mc+m\frac{m-1}{2}bb+\overline{m+n}\frac{bB}{A}+\frac{C}{A}=0$, and $c=\frac{\overline{m+1+2n}BB-2mAC}{2m^2A^2}$, &c.

Note. In all theſe Rules we have only purſued theſe ſeries to a few terms; to have gone farther would have taken up too much room; but the method is viſible.

Examp. Suppoſe $\frac{1}{2}xx+\frac{1}{3}x^3+\frac{1}{4}x^4+\frac{1}{5}x^5$, &c. $=y$. Here $z=x$, $v=2y$, $A=\frac{1}{2}$, $B=\frac{1}{3}$, $C=\frac{1}{4}$, $D=\frac{1}{5}$, &c. and $m=2$, $n=1$. Whence $x=v^{\frac{1}{2}}-\frac{1}{3}v^{\frac{2}{2}}+\frac{5BB-4AC}{8AA}v^{\frac{3}{2}}$ &c. $=v^{\frac{1}{2}}-\frac{1}{3}v+\frac{1}{2.18}v^{3}+\frac{1}{270}v^{2}$, &c.

Coroll. The reverted ſeries will always be of the ſame form as the given ſeries; otherwiſe they are not convertible into one another.

SECTION VI. OF EQUATIONS.

An Equation is the mutual comparing of two equal quantities differntly expreſſed with the ſign of (=) equality between them: thus $a+b=c-d$ is an Equation, ſhewing the equality of the quantity $a+b$, and $c-d$. See Definition XXII.

Art. I. *To turn proportional Quantities into Equations, and the contrary.*

Rule. Multiply the extremes together for one ſide of the Equation, and the two means together for the other ſide thereof; or, in geometrical progreſſions, when there are but three terms, ſquare the middle term for the other ſide of the Equation. If Equations are to be turned into proportions, the procedure is juſt the reverſe, for each of the Equations muſt be divided into two factors, and thoſe produced from one ſide of the Equation muſt be made the extremes; and ſo thoſe of the other ſide will be the two means. Thus if the proportion $a:d::c:x$ be given, the Equation derived from it will be $ax=dc$. Again, if the Equation $ab+ac=ca-de$ be given, it may be tranſformed into theſe proportions, as $a:1::ca-de:b+c$; or as $a:ca-de::b+c$; or as $b-c:1::ca-de:a$; or as $b+c:ca-de::1:a$; or as $1:a::b+c:ca-de$, or as $1:b+c::a:ca-de$; or as, $ca-de:b+c::a:1$; or as $ca-de:a::b+c:1$. For the Equation divides into $a\times b+c=1\times ca-de$, and the factors of each ſide may be made the means or extremes at pleaſure, and alſo each factor may be either of ſuch means or extremes; for by multiplying together the means and the extremes of any of theſe proportions according to the rule, the given Equation will be produced, which ſhews that their relation with each other has been preſerved.

Art. II. *To reduce an Equation.*

When Algebraical Queſtions are brought to an Equation, it muſt be ſo ordered that the quantity ſought may ſtand clear on the firſt ſide of the Equation, and the known quantities on the other ſide. To effect which obſerve the following directions. 1ſt. When any quantity is alike concerned on both ſides of the Equation it muſt be thrown out of both. Thus if $5x+5y=4c-d+5y$. Here $+5y$ being rejected from both ſides, the Equation becomes $5x=4c-d$: the reaſon of this is evident from Axiom the 2d. When the known and unknown quantities are both on one ſide, tranſpoſe any of them to the contrary ſide, and change its ſign. Thus is $4y+3b=ax-dy$. Then if y be the quantity ſought $-dy$ may be brought to the firſt ſide of the Equation, and $+3b$ may be carried to the ſecond ſide of the equation, by changing their ſigns, and hence it becomes $4y+d\,y=ax-3b$. This is the ſame as adding $-3b+4y$ (or ſubtracting $+3b-4y$) to both ſides of the Equation; therefore, by Axioms 1. and 2. the equality is preſerved. 3d. If there be fractions in the Equation, multiply both ſides of the denominators, and it will be freed therefrom.

Examp. Let $\frac{a^2}{b}+c=\frac{da}{c}$. Here both ſides being multiplied by b and c (or $b\,c$) it becomes $c\,x^2+b\,c^2=b\,d\,a$. This proceſs is founded on Axiom 3.

4th. When any quantity is multiplied into both ſides of the Equation (or into the higheſt term of the unknown quantity) divide the whole Equation thereby.

Examp. $5bx^3=3bc$. Here divide the Equation by b, and it becomes $5x^3=3c$: again divide it by 5, and x^3 will be equal to $\frac{3c}{5}$. The truth of this appears from Axiom the 4th.

5th. If the unknown quantity is affected with a ſurd, tranſpoſe the reſt of the terms, and then involve each ſide according to the index of the ſurd. Thus if $\sqrt{x^2+ax}+d=c$, by tranſpoſing d we have $\sqrt{x^2+ax}=c-d$, and by ſquaring both ſides $x^2+ax=c^2-2c\,d^2+d^2$, and ſo the Equation is freed from ſurds. This is plain from Axiom the 5th.

6th. When the ſide containing the unknown quantity is a pure power (or if being affected it has a rational root) then extract the root on both ſides of the equation. Thus if $x^2=b^2+a\ c$, then $x=\sqrt{b^2+d\,c}$, which, if b, c and d, are known quantities, may be extracted in numbers, and thence the value of x will be known. So likewiſe if $x^2+6x+9=25c$, by taking the ſquare root we have $x+3=+\sqrt{25c}$, and by tranſpoſing 3, $x=\pm\sqrt{25\,c}-3,=\pm5\sqrt{c}-3$.

N. B. All theſe methods are to be uſed as occaſion rerequires, till the Equation be duly cleared.

Examples.

Examp. I. What is the value of x in this Equation $24-4x+10=60-12x$? Here $+24$ and $+10$ in the firſt ſide of the Equation being transferred to the other ſide, and $-8x$ in the ſecond ſide of the Equation being transferred to the firſt ſide, it will ſtand thus $-4x+12x=60-24-10$, viz. (by collecting the terms, See Ax. 7.) $8x=26$, and by dividing both ſides by 8, $x=\frac{26}{8}=\frac{1}{4}$.

Examp. II. What is the value of x in this Equation $ax+b^2=\frac{ax^2+ac^2}{a+x}$. Here, by multiplying both ſides $a+x$, we have $a^2x+ab^2+a\,x^2+b^2x=a\,x^2+a\,c^2$, whence (by tranſpoſition) $a^2x+a\,x^2+b^2x-a\,x^2=a\,c^2-a\,b^2$, viz. (by expunging ax^2 it being concerned with both + and —) $a^2x+b^2x=a\,c^2,+a\,b^2$, and dividing both ſides of the Equation, by a^2+b^2, we have $x=\frac{a\,c^2-a\,b^2}{a^2+b^2}$

Examp. III. Let $\sqrt{a^2+x^2}=\sqrt[4]{b^4+x^4}$ be given to find x. Here by raiſing both ſides of the Equation to the 4th power $a^4+2a^2x^2+x^4=b^4+x^4$, and by tranſpoſition, &c. $2a^2x^2=b^4-a^4$, and dividing by $2a^2$ $x2=\frac{b^4-a^4}{2a}$

hence $x=\overline{\frac{b^4-a^4}{2a^2.}}\Big|^{\frac{1}{2}}$

Examp. IV. Let $x=\sqrt{c^2+a\sqrt{b^2+x^2}}-c$. Here $x+c=\sqrt{b^2+x\sqrt{b^4+x^2}}$, which ſquared gives $x^2+2c\,x+c^2=c^2+x\sqrt{b^2+x^2}$, or $x^2+2c\,x=\sqrt{b^2+x^2}$; and (dividing by x) $x+2c=\sqrt{b^2+x^2}$ which ſquared gives $x^2+4cx+4c^2=b^2+x^2$. By tranſpoſition, $4cx=b^2-4c^2$ and (dividing by $4c$) $x=\frac{b^2-4c^2}{4c}$

Art. III. *To exterminate an unknown Quantity out of several Equations.*

Rule. If the quantity has but one dimenſion in the Equations, ſeek the value of the quantity to be expelled in two Equations, and put thoſe values equal to each other; or having found the value of one Equation, ſubſtitute it in lieu of ſuch quantity in the reſt of the Equations. Proceed thus with another unknown quantity. But if the quantity to be exterminated be of ſeveral dimenſions, find the value of its higheſt power in two Equations; then if the co-efficients are not the ſame, multiply the leſs ſo that it may come equal to the greater. Then put theſe values equal to each other, and there will come out a new Equation, with a leſs power of the unknown quantity: and by repeating the operation, the quantity will at length be taken away.

Examples.

Examp. I. Given $7\,x-5\,y=28$, and $3\,x+5\,y=55$ to find x and y. 1ſt. Let y be exterminated. In the firſt Equation the value of y is $\frac{7x-28}{5}$, which is found by tranpoſition and diviſion. In the ſecond Equation its value (in like manner) is found $=\frac{55-3x}{4}$. Theſe being put equal to each other, we have $\frac{7x-28}{5}=\frac{55-3x}{4}$, an Eqution wherein only x is concerned. Multiply this Equation by 4 and 5 (or by their product $=20$) or, which is the ſame thing, multipy the numerator, and denominators croſs wiſe, and we have $28x-112=275-15x$. By tranſpoſition $43x=387$ and by diviſion, $x=\frac{387}{43}=9$; which ſubſtituted in either of the given Equations inſtead of x, the value of y then will appear. Thus if it be ſubſtituted in the ſecond Equation, $27+4y=56$, and by tranſpoſition and diviſion $y=\frac{55-27}{}=7$.

Examp. II. Let it be required to find the values of x, y and z, in the three following Equations, viz. $x+y=17$; $x+z=18$; and $y+z=19$. Here, by ſubtracting the firſt

Equation from the ſecond (in order to exterminate x) we have $z-y=1$, and this added to the third Equation, y is alſo exterminated; and there is found $2z=20$, and conſequently $z=10$, and y $(=z-1)=9$, and x $(=17-y)=8$.

Examp. III. Let there be given $x+y=a$; and $x^2+y^2=b$ to expunge x. Here by the firſt Equation $x=a-y$, and therefore $x^2=\overline{a-y}\,\rceil^2$, which being wrote in the other Equation inſtead of x^2 we have $\overline{a-y}\,\rceil^2+y^2=b$; viz. $a^2-2ay+y^2+=b$; and therefore $y^2-ay=\frac{b-a^2}{2}$; a Quadratic Equation, whereby y is the only unknown quantity.

Art. IV. *Of the nature and Compoſition of Equations, containing different Dimenſions of the ſame unknown Quantity.*

In the laſt article we have ſhewn the method of freeing Equations from any unknown quantity, whereby two or more Equations are reduced to one, containing only one unknown quantity, the value of which, when it is a ſimple Equation, we have alſo ſhewn how to find; but it will often happen, that the remaining quantity will be of ſeveral different dimenſions in the Equation, and then ſuch Equation is called a Quadratic, a Cubic, Biquadratic, &c. according to the dimenſions of the higheſt power. To manage Equations of this kind, ſo as to diſcover the Root or value of the unknown Quantity concerned, will be treated of in the following Articles of this Section, after having here explained the nature and compoſition of ſuch Equations.

All Equations may be conſidered as compounded of thoſe of a lower order: thus of $x-b=0$, which is a ſimple Equation, be ſquared, there ariſes $x^2-2bx-b^2=0$, a Quadratic; if cubed, we have $x^3-3bx^2+3b^2x-b^3=0$, a Cubic Equation, &c. It is, however, but ſeldom that Equations occur in this regular form, for the co-efficients of the terms will generally be greater or leſs than are aſſigned by the involution of one quantity $x-b$, and therefore in general a Quadratic is a compound, derived from $\overline{x-b}$, $\times$ $\overline{x-c}$; a Cubic from $\overline{x-b}\times\overline{x-c}\times\overline{x-d}$; a Biquadratic from $\overline{x-b}\times\overline{x-c}\times\overline{x-d}\times\overline{x-e}$, or from a Quadratic ſquared, &c. But the letters b, c, d, &c. may be affirmative, or ſome may be affirmative and others negative, whereby different ſigns will be produced in the Equations anſwerable to all Caſes.

In an Equation of this ſort, the whole being equal to nothing, it is obvious that ſome or other of the factors $x-b$, $x-c$, $x-d$, &c. ſhould be equal to nothing; or the Equation (which is their product) could not be ſo. It is alſo evident, that any ſuch Equation may be divided by its factors till there remains only one factor; and as each of the inferior equations obtained by ſuch diviſion muſt ſtill be equal to nothing, whatever factor was the diviſor, it follows that each of theſe factors are themſelves equal to nothing; and therefore b, c, d, e, &c. exhibit ſo many different values of x, with contrary ſigns; and hence every Equation has as many roots as there are dimenſions of the unknown quantity in its higheſt power; and where b, c, d, e, &c. are found negative, x is affirmative; and where any of theſe are affirmative, x is negative. By multiplying the factors or Roots together, under different ſigns, it is obſervable, that when b, c, d, &c. are all negative, or which is the ſame thing, when all the values of x are affirmative, the ſigns of the Equation run $+$ and $-$ alternately; but when there is a negative Root, one affirmative quantity will follow another: wherefore there will be as many affirmative roots in the Equation as there are changes of the ſigns from $+$ to $-$, and from $-$ to $+$, and all the reſt will be negative.

Theſe obſervations, however, are only applicable when all the Roots are poſſible. A Root is impoſſible, or imaginary, when b, c, d, &c. denote the Square, or other even Root, of a negative quantity; and when an Equation is wholly derived from ſuch Roots, it is an impoſſible Equation; if there be one poſſible Root, the Equation will admit of one poſſible anſwer. But in applying Algebra, there will frequently be other limitations peculiar to the ſubject, whereby but one Root only will be capable of ſatisfying the enquiry, even when the reſt of the Roots are both poſſible and affirmative.

From the multiplication of the Roots, or Factors, it is further evident, and worthy of notice, that the co-efficient of the ſecond term is the ſum of all the Roots with contrary ſigns; the co-efficient of the third term, is equal to the ſum of the Rectangles of thoſe roots, or of all the products that can poſſibly ariſe by compounding them two and two: the co-efficient of the fourth is equal to the ſum of all the products that can poſſibly ariſe by the combination of them three and three, &c. and ſo on; and the laſt term is always equal to the product of all the Roots, with contrary ſigns.

Theſe things being premiſed, we proceed to ſhow how to find the roots of equations, and ſhall begin with quadratics.

Art. V. *Reſolution of Quadratic Equations.*

The following eaſy, conciſe and comprehenſive method of ſolving Quadratic Equations, we believe, is not in any other treatiſe on the ſubject; its advantages, however, over every other mode, will at once be obvious to thoſe who are the leaſt converſant in Algebra.

If it be a pure Quadratic, as $x^2=b^2$, or $x^2-b^2=0$, it is produced from the Rectangle of $x-b$ and $x+b$, and therefore it has one Root affirmative and the other negative; and the affirmative Root is equal in number to the negative Root. The Root in this caſe is had by extracting the Square Root of the number dented by b^2. Thus if x^2+ $=576$, then $x=\pm\sqrt{576}=\pm 24$.

All other Quadratics are comprehended under ſome or other of the following forms, viz. $x^2+2bx=\pm d=0$; or $x^2-2bx\pm d=0$; or $2bx-x^2\pm d=0$; and this laſt form by tranſpoſing (or changing the ſigns) becomes the ſame as the ſecond form, ſave that the affirmative Roots are changed into negative ones, and the negative ones into affirmative ones; wherefore it will be ſufficient to conſider the two other forms as applicable to all; and in attempting their ſolution, it will be more commodious to tranſpoſe d, and then they will ſtand thus: $x^2+2bx=\pm d$, and $x^2-2bx\pm d$. Now if to each of theſe Equations we add $+b^2$, (the ſquare of $\frac{1}{2}$ the co-efficient of the ſecond term) we ſhall have in the former caſe $x^2+2bx+b^2=\pm d, +b^2$; and in the latter,

$x^2-2bx+b^2=d\pm b^2$; and by extracting the Square Roots, the Equations become $x+b=\sqrt{\pm d+b^2}$, and $x-b=\sqrt{\pm d+b^2}$ reſpectively; and x in the former caſe $=\sqrt{+d+b^2}-b$, and in the latter $=\sqrt{\pm d+b^2}+b$, which expreſſions give the affirmative values of x: but the Square Roots of the above Equations may alſo be $-x-b=-\sqrt{\pm d+b^2}$, and $-x+b=-\sqrt{\pm d+b^2}$ reſpectively; and therefore x in the former caſe $=-\sqrt{+d+b^2}+b$, and in the lattter $=-\sqrt{+d+b^2}-b$. That is, if B be put $=\sqrt{\pm d+b^2}$ where d is $+$ or $-$, according as it is $+$ or $-$ in the ſecond ſide of the given Equation, then, in the firſt caſe, where $x^2+2bx=+d$, the values of $\pm x$ are $\pm B\mp b$, where b is $-$ or $+$, according as x is affirmative or negative; and in the ſecond caſe, where $x^2-2bx=\pm d$, the values of $\pm x$ are $+\overline{B\pm b}$ where b is $+$ or $-$, as x is $+$ or $-$.

EXAMPLES.

EXAMP. I. Let $x^2+6x=2295$ required x. Here $b=3$ and $2295=+d$; and $\sqrt{+d+b^2}=\sqrt{2295+9}=48=B$, and $\pm B\mp b=\pm 48\mp 3=+45$ and -51 for the two values of x.

EXAMP. II. Let $x^2-6x=1755$ be given to find the values of x. Here $b=3$, and $1755=+d$, and $\sqrt{+d+b^2}=42=B$, and $\pm x=\pm B\pm b=\pm 42+3=+45$ and 39, the values ſought.

EXAMP. III. Let $x^2-11x=-28$. Here $b=\frac{11}{2}$, and $28=-d$; alſo $b^2=30\frac{1}{4}$. and $\sqrt{-d+b^2}=\sqrt{-28+30.25}=\sqrt{2.25}=1.5=B$; and $\pm B\pm b=\pm 1.5\pm 5.5=+7$ and $+4$ the two values of x, which in this caſe are both affirmative.

EXAMP. IV. Let $24x-x^2=135$, required x. This Equation being wholly tranſpoſed $x^2-24x=-135$. Here $b=12$; and $-135=-d$. and $\sqrt{-d+b^2}=\sqrt{-135+144}=\sqrt{9}=3=B$; and $\pm B\pm b=\pm 3\pm 12=+15$ and -9 the two Roots; but the Equation having been transformed, the ſigns muſt be changed, and ſo $+9$ and -15 are the Roots required. When d is negative, and greater than b^2, the Roots are impoſſible.

EXAMP. V. Given $x^2-10x=-32$. Here $b=5$, and $-32=-d$, and $B=\sqrt{-d+b^2}=\sqrt{-32+25}=\sqrt{-7}$, and therefore the Roots are impoſſible, and the Equation is an impoſſible Equation.

ART. VI. *To increaſe or diminiſh the Roots of an Equation.*

Rule. For the unknown quantity ſubſtitute a new letter ;— the given increment, or + the given decrement; and ſubſtitute the powers thereof in the Equation inſtead of the unknown letter.

EXAMPLES.

Let the Roots of this Equation $x^3+x^2-10x+8-0$ be increaſed by 2. Let $x+2=z$, or $z-2=$, then $x^3=\overline{z-2}|^3$; $x^2=\overline{z-2,}|^2$ and $-10x=-10\times z-2=-10z+20$, then the powers of z being actually involved, and the ſeveral terms collected, we have $x^3+x^2-10x+8=z^3-5z^2-2z+24=0$, where the roots of z are greater than thoſe of x by 2.

SCHOLIUM. By this Rule all the Negative Roots of an Equation may be made affirmative, by increaſing them with a proper quantity.

ARTICLE VII.

To multiply or divide the Roots of an Equation by a given Quantity.

Rule. Aſſume a new letter, and divide or multiply it by the given number, and ſubſtitute its powers in the Equation inſtead of the unknown quantity.

EXAMPLE.

Let the Roots of the Equation $x^3-2x+\sqrt{3}+0$ be divided by $\sqrt{+3}$. Here by putting $x=y\sqrt{3}$, and ſubſtituting it in lieu of x in the given Equation, there ariſes $3y^3\sqrt{3}-2y\sqrt{3}+\sqrt{3}=0$, $=$(by dividing by $\sqrt{3}$) $3y^3-2y+2=0$, for the Equation required.

Hence by this rule fractions or ſurds may be taken out of an Equation; by dividing the new letter by the common denominator; or by multiplying the new letter by the ſurd quantity.

ART. VIII. *To complete a deficient Equation.*

Rule. Increaſe or diminiſh the Roots of an Equation by ſome given quantity as in Art. VI.

EXAMP. Let $x^3+x-3-0$. Here the Equation is deficient, the 2d term being wanting. Suppoſe $z+1=x$, then $x^3=z^3+3z^2+3z+1$; this added to $x\,(=x+1)-3$, we have $z^3+33z^2+4z-1=0$, a complete Equation, in which the roots are each leſs by 1 than in the given Equation.

ART. IX. *To take away any term out of an Equation.*

Rule. Take a new letter for the root, to which add an unknown quantity, and ſubſtitute this ſum and the powers thereof in the given Equation; then any term, or any of thoſe quantities wherein the new letter is of the ſame power, being put into an Equation, and made equal to nothing, will give the value of the unknown quantity, which being put into the Equation with the new letter, the power of the new letter, which was ſo equated, will vaniſh.

EXAMPLES.

Suppoſe $x^4-3x^3+3x^2-5z-2=0$. Put $y+e=x$

$$\begin{array}{lll} \text{Then } x^4 & = & y^4+4y^3e+6y^2e^2+4ye^3+e4 \\ -3x^3 & = & -3y^3-9ye-9ye^2-3e^3 \\ +3x^2 & = & +3y^2+6ye+3e^2 \\ -5x & = & -5y-5e \\ +2 & = & +2 \end{array}$$

Then, if the ſecond term is to be taken away, we have $4y^3e-3y=0$; and dividing by y^3, $4e-3=0$, or $e=\frac{3}{4}$, which if ſubſtituted in the room of e, the ſecond term will vaniſh: if the third term is to be taken away, we have $6y^2e^2-9y^2e+3y^2=0$, and dividing by y^2, $6e^2-9e+3=0$, from which Quardratic Equation e may be determined: in like manner the 4th term may be taken away by ſolving a Cubic Equation; the 5th by ſolving a Biquadratic, &c.

SCHOLIUM. From the above proceſs it appears, that when the ſecond term is to be taken away, the value of e is obtained by dividing the co-efficient of that term by the index of the higheſt power in the given Equation, ſeeing that the co-efficient of the 2d term of the nth power of a Binomial is n. And this is the moſt uſeful caſe, the reſt being much too tedious to be of real ſervice in finding the roots.

ARTICLE X.

To reſolve or extract the Root of a Cubic Equation.

Rule. Take away the ſecond term of the Equation as by the laſt article, and then it will be in this form, $x^3+ax=b$, and this general expreſſion $\overline{\frac{b}{2}+\sqrt{\frac{b^2}{4}+\frac{a}{27}}}\Big|^{\frac{1}{3}} - \frac{\frac{1}{3}a}{\overline{\frac{b}{2}\sqrt{\frac{b^2}{4}+\frac{a^3}{27}}}\Big|^{\frac{1}{3}}}$ will give the value of x.

EXAMP. Let $y^3+3y^2+9y=13$. Here to deſtroy the 2d Term, put $x-1=y$, ſo ſhall $\overline{x-1}^3+3\times\overline{x-1}^2+9\times\overline{x-1}=13$, or (by involving the terms, &c.) $x^3+6x=20$. Therefore $a=6$, and $b=20$; and theſe values ſubſtituted in the above form, we have $\overline{10+\sqrt{100+8}}\Big|^{\frac{1}{3}}-\frac{2}{\overline{10\sqrt{100+8}}\Big|^{\frac{1}{3}}}$ $=\overline{20{,}3923}\Big|^{\frac{1}{3}}-\frac{2}{20{,}3923^{\frac{1}{3}}}=2.732-.732=2=x$, but $x-1=y$, by ſubſtitution, and therefore $y=1$.

SCHOLIUM. The above Rule will hold equally as good when b and a are either or both of them negative. But when a is negative, and $\frac{1}{27}a^3$ is greater than $\frac{1}{4}b^2$, the Equation by this Rule will be impoſſible, except when the Surd Cubic Root can be extracted; for then the irrational quantities in different parts of the Equation will deſtroy one another, and vaniſh. But this Rule is only calculated to ſolve Equations comprehending one real Root, and two impoſſible ones. It is generally known by the name of *Cardan's* Rule; but M. de Montucla in his Hiſtory of Mathematics, has proved that *Cardan* was not the inventor. *Scipio Ferreus*, and *Nicholas Tartalea*, did each diſcover it independently of one another, & at or about the ſame time.

We might further lay down particular rules for the accurate ſolution of Biquadratic and other higher Equations; but they are all more curious than uſeful; and the method of approximating the Roots of Equations, of which we ſhall treat in the next Article, has the deſerved pre-eminence above all others, as well on account of its diſpatch, as of its elegance and univerſality.

ARTICLE XI.

To approximate the Roots of Equation in general.

Rule. Chooſe ſome number at pleaſure to denote the unknown quantity, and apply it to the given Equation, by which it will be diſcovered whether ſuch number be too big or too little. If it widely differs from the true value, try another number that approaches nearer; and, by a few trials in this manner, a number will ſoon be found that approaches pretty near the true value. Then aſſume ſome letter, as v, to denote the defect or exceſs of the number ſo found, and put that number + or — v inſtead of the unknown quantity in the Equation, by which a new Equation will be had, affected only with v, and known quantities; wherein all the terms that contain two or more dimenſions of v may be rejected as inconſiderable in reſpect to the reſt. This done, the value of v may be found by a ſimple Equation, which, added or ſubtracted from the ſaid number, according as it was taken too little or too big, will give a number ſtill nearer the truth. With this number and the letter v proceed as before, to find another value of v, which muſt be applied as above; repeat the operation till the quantity, which was unknown, be determined to a ſufficient degree of accuracy.

EXAMPLE.

Let $x^3+24x=587814$, to find x. By a few trials it will be found that x is ſomething above 80; therefore let $80+v=x$; then $x^3=512000+192000v+1680v^2+v^3$ and $24x=1920+24v$. Therefore rejecting thoſe terms affected with v^2 and v^3, $513920+19224v=587914$, and $v=\frac{587914-513920}{19224}=\frac{73994}{19224}=3.8$: this added to 80 gives 83.8 for the approximate value of x: this being ſubſtituted in the Equation, it will be found too great; therefore for another operation, take $83.8-v=x$, and $x^3=588480.472-21067.32v$, and $24x=2011.2-24v$, and conſequently $590491.672-21091.32v=587914$, and $v=\frac{2577.672}{21091.32}=0.1222$ nearly. Hence $x=83.8-0.1222=83.6778$. true to five figures, and the ſixth being only too much by two.

The operation repeated, will give the anſwer true to 11 figures. But when five or ſix figures of the Root have been obtained, and ſtill more exactneſs is requiſite, it will ſhorten the operation to ſeek a correction for v inſtead of one for the whole Root, which will be had by ſubſtituting the laſt value of v + or — (new) v, inſtead of the laſt v in the Equation, including all the powers of the laſt v; but (in the Equation thence ariſing) rejecting thoſe of new v as before.

Thus, in the laſt Example, the whole Equation including the terms affected with v^2 and v^3 is $513920+19224v+1680v^2+v^3=587914$, or $19224v+1680v^2+v^3=73994$ and in this Equation putting $3.8-v$ inſtead of v, and rejecting the terms of v^2 and v^3 as before, a correction will be obtained for the laſt found v, which will give the anſwer, as above. In like manner a ſecond or a third, &c. correction may be found to any degree of accuracy. This Rule doubles the number of figures true in the Root of each operation. If the term wherein v^2 is found be retained, v will be had by ſolving a Quadratic, and then treble the number of figures will be had at each time; wherefore, if the firſt figure only be taken true, nine or ten figures will be had at two operations.

From this principle may be deduced various Theorems for ſolving particular Equations, as well as general formulas adapted to all, of which we ſhall give an inſtance or two, and then conclude the article.

Let r be a number taken near to the true Root; and v (as before) = its exceſs or defect. Now if $x^2+bx=c$ be a quadratic; then $r+v=x$, and $x^2=\overline{r\pm v}^2=r^2\pm 2rv\pm v^2$; and $bx=brbv\pm$; hence $r^2+br\pm\overline{2r+b}.\times v+v^2=c$; and by tranſpoſition and diviſion $v=\frac{c-r^2-br}{\pm 2r+b+v,}$ which is a general formula for all quadratics, obſerving that when b is negative in the given Equation, that is, when the 2d term is negative, then $-br$ in the numerator becomes $+br$, and $+b$ in the denominator become $-b$: alſo if the given Equation be $x^2=c$, then $b=0$, and thoſe terms wherein it is concerned, will vaniſh, and the expreſſion will be $\frac{c-r^2}{\pm 2r+v}$ which is the common Rule for extracting the Square Root, only it is uſual to take r leſs than juſt, and ſo the negative ſign is excluded from the denominator. To give an example of this method,

Let $x^2+6x=61495=c$. Here by trial it will be found that x is above 200: therefore let $200=r$; then $-b=-1200$; and $c-r^2-br=20295$. The method of performing the diviſion is as follows:

Operation.

$$\begin{array}{lll}
2r+b=406 & & \\
v'=\underline{40}\Big) & 20295\ \Big(45=v, \text{ and } r+v=300+45= & \\
3r+b+v'=446 & & (245=x. \\
\quad 40 & 1784 & \\
2r\ (new)+b=486\Big) & 2455 & \\
v''=5\Big) & 2455 & \\
2r+b+v''=\overset{491}{=\!=} & \ldots &
\end{array}$$

Again, for a Cubic Equation. Let $x^2+bx^2+dx=c$. Put $r\pm v=x^2$. So will $x^3=r^3\pm 3r^2v++3rv^2\pm v^3$; $b\overline{x^2}=br^2\pm 2brv+bv^2$, and $dx=dr\pm dv$. Hence, $r^3+br^2\pm\overline{3r^2+2br+d}\times v+\overline{3r+b}\times v^2+dr=c$. ($v^3$ being rejected as ſmall in compariſon of the reſt;) and by tranſpoſition $\pm\overline{3r^2+2br+d}\times v$, $+\overline{3r+b}\times v^2=c-r^3-br^2-dr$; and $v=\pm\frac{c-r^3-br^2-dr}{\overline{3r^2+2br+d}+\overline{3r+b}.v}$ to be wrought after the ſame manner as the laſt Example.

Or if $\frac{+\overline{3r^2+2br+d}}{3r+b}$ be put $=2m$, and $\frac{o-r^3-br^2-dr}{3r+b}=p$, then (per quadratics) $v=\sqrt{\overline{p+m^2}}\pm m$. When three or four figures are found they muſt be taken for new r, and the operation muſt be repeated.

Or, if $\pm\overline{3r^2+2b}\,r+d$ be put $=g$, and $3\,\overline{r+b}=h$, and $c-r^3-br^2-dr=p$, then (ſince $\frac{p}{g}=v$ nearly) $\frac{p}{\pm g+h\times p}$ will admit $=v$ more nearly.

Or the ſame may be rendered general after this manner. Let n be the higheſt power, and A, B, C, &c. be the aggregate co-efficients of v, v^2, v^3, &c. and if the given Equation be x^n, $\pm ax^{n-1}\pm bx^{n-2}+cx^{n-3}+$, &c. (to px) $=N$, then $\pm Av+Bv^2\pm Cv^3+$ &c. $=N-r^n-ar^{n-1}-br^{n-2}-cr^{n-3}-$ &c. (to pr) $=P$; and, by taking the two firſt terms of the ſeries as ſufficient for an approximation, we have $\pm Av+Bv^2=P$, and therefore $v=\sqrt{\frac{P}{B}+\frac{A^2}{4B^2}}\mp\frac{A}{2B}$; or $v=\frac{P}{\pm A+Bv}$; and taking the firſt approximate, $\frac{P}{A}$, for v, we have $\frac{P}{\pm A+\frac{BP}{A}}$ for the value of v; either of which rules are general, and will converge ſufficiently ſwift.

Art. XII. *To approximate the Roots of Exponential Equations.*

Rule. Let $x^x=c$ be given to find x. Seek a number (by trial) which ſhall be near the Root, and take the logarithm thereof; multiply this logarithm by the ſaid number; then take the difference between this product and the log of the given number c, and note it down with the ſign + or — according as the product exceeds or falls ſhort of the log of c. Proceed in like manner with another number (taken for the Root) and by the method of trial and error, as given in our New Syſtem of Arithmetic, find the value of x.

If it be not exact enough, freſh numbers may be taken very near the Root, whereof the value of x laſt found may be one, and by thus repeating the operation as often as ſhall be requiſite, x may be had to any degree of accuracy.

Examp. Let $x^x=256$, required x. Suppoſe $x=3$; then the logarithm of 256 is 2,40824, and the logarithm of 3=4771213: this multiplied by 3, the product will be found deficient of 2,40824, by 1,07788, and therefore the ſuppoſition 3 is too little.

Again, ſuppoſe $x=5$; then its logarithm .69897 multiplied by 5 will be found too much by 1.08661; and theſe ſuppoſitions and errors being managed according to the method abovementioned, x will be found=3.996, erring only 4 in the laſt figure, the true anſwer being 4; and by taking 3.996 as a new ſuppoſition, along with ſome other number nearly equal to it, the anſwer would be had with far more exactneſs. There are other ways of ſolving theſe Equations, but none that will more quickly approximate to the true value than this exceedingly eaſy one.

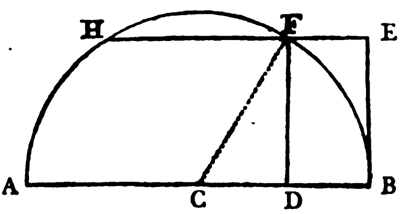
SECTION VI.
CONSTRUCTION OF EQUATIONS.

When in the Solution of an Equation ſtrict accuracy is not required, the anſwer may be determined geometrically, by drawing right lines or curves after ſuch a manner, as, by their interſections, ſhall limit and determine its roots: but ſince the extraction of roots by approximation has been brought to ſuch perfection, ſo that either a few, or as many figures as one pleaſes, may be readily obtained, geometrical conſtructions have, in a great meaſure, been laid aſide, particularly in Equations of high dimenſions, where recourſe may be had to the Conic Sections, and other curves ſtill more difficult to delineate ; as the trouble in ſuch caſes would be almoſt infinite, and at laſt fail of producing a correct anſwer.

We ſhall therefore only give the conſtruction of Quadratic and Cubic Equations, which may be done without much pains by means of a circle, paſſing over thoſe of the higher orders, as well as thoſe of ſimple Equations, for which no preciſe rule can be given ; but the methods will be different according as the unknown quantity is differently entangled with others, and the aſſiſtance alſo of geometrical propoſitions, too various to enumerate here, are frequently called in.

Art. I. *To construct Quadratic Equations.*

Problem I. To extract the Square Root, or to find the root or ſide of a given ſquare as x in this Equation, $x^2 = nm$. Rule. The given quantity being divided into two factors, as n take AD = one factor (n) and DB = the other (m;) divide AB equally in c, and from thence as a center deſcribe the ſemicircle A F B ; erect from D, a perpendicular to AB, and DF will be equal to x ; for by the property of the circle, AD ($=n$) × DB ($=m$) $=$ DF², and therefore DF $= x$.



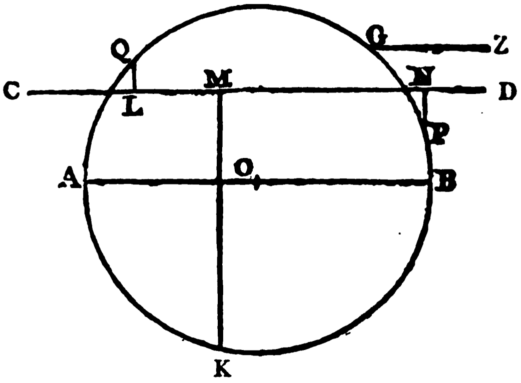
Prob. 2. To conſtruct a Quadratic of this form, $x^2 \pm bx = c.d.$ Rule. Find the ſide of a ſquare equal to the rectangle $c\ d$ by the laſt problem, which call n, then from any point C in a line A B drawn at pleaſure, ſet off, to the right, CD $= \frac{1}{2}b$, if b is affirmative : but to the left if b is negative : erect a perpendicular from D, and take DF $= n$, then from C as a center, with the Radius CF deſcribe the circle AFB, ſo will BD and DA be the two roots, that to the right hand of D being affirmative, and that to the left negative.

Prop. III. To conſtruct a Quadratic Equation of this kind, namely, $x^2 \pm bx = -nn$. Rule. Here the given quantity $-nn$ being divided into equal factors (but of contrary affections) by Problemn 1, namely, $+n$ and $-n$, let a circle be deſcribed from any point C in a center in the right line AB : with the radius $= \frac{1}{2}b$, erect a perpendicular at B, on the right, if it be $+b$ (but, at A on the left if it is $-b$;) take BE $= n$; through E draw EFH parallel to AB, interſecting the circle in F and H, ſo will EF and EH be the two roots required, which if they lie towards the right of E are affirmative ; but if towards the left, they are negative.

N. B. If the parallel does not cut the circle or touch it, the Equation is impoſſible.

Art. II. *To construct Cubic Equations.*

Let the Equation be $x^3 \pm px^2 \pm \underline{qx = r}$; to conſtruct which, obſerve this rule, with the radius $\frac{2}{3}\sqrt{p^2 - 3q}$, deſcribe the circle BGAK (as in the following figure) drawing the diameter AB and CD parallel thereto, above or below the ſame, at the diſtance of $\frac{1}{3}p$, according as p is $+$ or $-$; then draw ZG parallel to AB, and above or below it at the diſtance of $\frac{9r - pq}{p - 3q} + \frac{2}{3}p$, as the ſame diſtance ſhall be as affirmative or negative quantity ; cutting the circle in G. Alſo take the arch BP $= \frac{1}{3}$ BG, and let PQ, QK and KP divide the whole circle into three equal parts. Let fall the perpendiculars QL, KM and BN upon the line CD, and they will be the roots of the Equation; thoſe which are affirmative being above the line, but thoſe which are negative below it.



Scholium. This method ſuppoſes all the roots real, and therefore, when $3q$ is greater than p^2 (which will be the caſe where there are impoſſible roots) the conſtruction is impoſſible. Likewiſe, if $p = 0$. O B will be $= \frac{2}{3}\sqrt{-3q}$, and CD will coincide with AB, and the diſtance ZC from AB $= \frac{3r}{q}$: and if q is affirmative, the caſe is impoſſible.

SECTION VII.

LIMITS OF EQUATIONS, INDETERMINATE PROBLEMS, &c.

Art. I. *To find the Limits of Equations.*

When an Equation contains ſeveral unknown quantities, it will admit of an infinite number of ſolutions, if both fractional, and negative numbers are admitted ; for all of them, except one, may be taken at pleaſure, and their values being aſſigned and ſubſtituted in the Equation, that ſingle quantity will be determined. However, ſometimes queſtions are ſo propoſed as not only to exclude negative quantities, but fractional quantities alſo ; and an Equation under ſuch circumſtances will be confined to a determinate number of ſolutions ; for the unknown quantities will have certain limits or bounds, without which, if they be taken, they will not anſwer the conditions of the caſe in hand. To aſſign thoſe limits is the buſineſs of this article.

Case I. *When several unknown Quantities are in one Equation, to find their Limits.*

Rule. Tranſpoſe the negative quantities to the contrary ſide, that all the terms may be affirmative ; then to find the limits of any one quantity, ſuppoſe all the reſt to vaniſh in the Equation, and ſo the value of that one will become determinate, and will be one limit thereof. And to know which limit it is, ſuppoſe the other quantities to increaſe, and become of ſome certain value : then if, by this procedure, the value of the unknown quantity under conſideration increaſes, it is the leaſt limit ; but if it decreaſes, it is the greateſt.

This rule includes fractional quantities. If, however, fractional quantities are to be excluded, then, inſtead of ſuppoſing the other quantities to vaniſh, put each of them $=1$, and an Equation will be had from which the limit of the remaining quantity will be determined as before. Proceed in the ſame manner to find the limits of the reſt of the unknown quantities.

Examp. Let $4x+5y=67$, to find the limits of x and y, including fractions. Let $y=0$, or be ſuppoſed to vaniſh, and then $4x=67$, and $x=16\frac{3}{4}$. Now let y be ſuppoſed = to ſome quantity, and then it is plain, that while y increaſes, x decreaſes; therefore $16\frac{3}{4}$ is the greater limit; whence x is leſs than $16\frac{3}{4}$.

If $x=0$, then $5y=67$, and $y=13\frac{2}{5}$. If now x be ſuppoſed to increaſe, it is plain y will decreaſe, and therefore $13\frac{2}{5}$ is the greater limit of y. Whence y is leſs than $13\frac{2}{5}$; and the leſs limit of both x and y is 0.

Again, let the ſame be propoſed, excluding fractions; then to find a limit for x, put $y=1$, and the Equation becomes $4x+5=67$; or $4x=62$, and $x=15\frac{1}{2}$, its greater limit; viz. x is leſs than $15\frac{1}{2}$. Alſo by putting $x=1$, we have $5y+4=67$, or $5y=63$, and $y=12\frac{3}{5}$; and hence y is leſs than $12\frac{3}{5}$; the leſs limit of both x and y is 1, viz. neither x nor y can be leſs than 1.

Case II. *When Three or more unknown Quantities are in two Equations, to determine their Limits.*

Rule. Having pitched upon a quantity to be limited, expunge one of the other quantities, and there will be had one limiting Equation. Then do the ſame with another unknown quantity, and there will be had another limiting Equation; from each of which Equation, find a limit for the quantity pitched on.

Examp. Let $v+y+z=56$, and $32x+20y+16z=1232$, to limit x. Firſt. In order to exterminate y, multiply the firſt Equation by 20, and there will be $20x+20y+20z=1220$. Subtract this from the ſecond Equation, and $12x-4z=112$. Then (excluding fractions) the leſs limit of x in this Equation is $9\frac{2}{3}$.

Again, to exterminate z, multiply the firſt Equation by 16, and ſubtract the product from the ſecond Equation, and you will have $16x+4y=336$. And the greater limit of x in this Equation, is $20\frac{1}{4}$. Hence x is greater than $9\frac{2}{3}$, and leſs than $20\frac{1}{4}$. In like manner may y and z be limited; and ſo alſo for any other Equation.

Scholium. When the numbers are ſought by two Equations, all the values of each of them, in whole numbers, make three ſeries of Arithmetical Progreſſion, taken within their proper limits.

Art. II. *Of indeterminate Problems.*

Lemma Let $\frac{ax+b}{c}$ be an Algebraic Fraction in its loweſt terms; x being indeterminate, and a, b, and c, being given whole numbers; then the leaſt integer for the value of x, that will alſo cauſe the value of the ſaid Fraction to be an integer, will be found by the following method.

Divide the denominator (c) by the co-efficient (a) of the indeterminate quantity; alſo divide the diviſor by the remainder, and the laſt diviſor, again, by the laſt remainder, and ſo on till an unit only remains. Write down all the quotients in a line as they follow, under the firſt of which write an unit, and under the ſecond write the firſt; then multiply theſe two together; and having added the firſt term of the lower line (or an unit) to the product, place the ſum under the 3d term of the upper line; multiply in like manner the next two correſponding terms of the two lines together, and having added the ſecond term of the lower to the product, put down the reſult under the fourth term of the upper one. Proceed on in this way till you have multiplied by every number in the upper line. Then multiply the laſt number thus found by the abſolute quantity (b) in the numerator of the given fraction, and divide the product by the denominator; ſo ſhall the remainder be the true value of x required, provided that the number of terms in the upper line be even, and the ſign of b be negative; or that the number be odd, and the ſign of b be affirmative; but if the number of terms be even, and the ſign of b be affirmative, or *vice verſa*, then the difference between the ſaid remainder and the denominator of the fraction will be the true anſwer.

N. B. In this method it is ſuppoſed that a is leſs than c, and that they are prime to each other; for were they to admit of a common meaſure, whereby b is not diviſible, no integer could be aſſigned for x, ſo as to give the value of $\frac{ax+b}{c}$ an integer.

Examp. Let the given quantity be $\frac{71x+10}{89}$, then the operation will ſtand as below.

$$\begin{array}{lllllll}
71)89(1 & & 1 & 3 & 1 & & \text{Quotients} \\
\overline{18})71(3 & & 1 & 1 & 4 & 5 & \\
\overline{17})18(1 & & & & & 10=b & \\
\overline{1} & & & & & \overline{50} & \textit{Product.}
\end{array}$$

Now if the Product (50) be divided by 89, the remainder is 50, which is therefore = the leaſt value of x.

Quest. I. Required the leaſt whole number, which, being divided by 17, ſhall leave a remainder of 7; but, if divided by 26, the remainder ſhall be 13? Here let $x=$ the quotient by 17, and then will $17x+7=$ the number ſought: alſo, ſince this number, when 13 is ſubtracted from it, is diviſible by 26, it follows, that $\frac{17x+7-13}{26}$ or $\frac{17x-6}{26}$ muſt be a whole number, from which fraction x will be found by the above lemma $=8$; and conſequently $17x+7=143$ is the number ſought.

Quest. II. Given $24x-13y=16$ to find the leaſt values of x and y in whole numbers. Here by tranſpoſing $-13y$, and dividing by 24, we have $x=\frac{13y+16}{24}$; and by the lemma, the leaſt value of y in the fraction $=8$; and therefore the leaſt value of $x=5$.

Quest. III. How many different ways is it poſſible to pay 100 pounds in guineas and piſtoles only; a guinea being 21 ſhillings, and a piſtole 17 ſhillings? Put $x=$ number of guineas, and $y=$ number of piſtoles; then $21x+17y=(100\times20)=2000$ by the queſtion; and therefore $x=\frac{2000-17y}{21}=95+\frac{5-17y}{21}$, = a whole number; and therefore (by tranſpoſition) $\frac{17y-5}{21}$ is alſo a whole number; whence by the lemma, the leaſt value of y is 4; and therefore the correſponding or greateſt value of $x=92$. Now to find the leaſt value of x and the greateſt value of y, take the value of y in terms of x; and $y=\frac{2000-21x}{17}=117-x-\frac{4x+11}{17}=$ a whole number; and therefore $\frac{4x-11}{17}=$ a whole number, and by the lemma, the leaſt value of x is 7, and the correſponding or greateſt value of $y=109$: now ſince the ſeveral values of x are, as is evident, in an arithmetical progreſſion, whoſe common difference is 17, and thoſe of y in a like progreſſion, whoſe common difference is 21, and the intermediate values of x and y are eaſily determined, and are as under:

$x=92,\ 75,\ 58,\ 41,\ 24,\ 7.$
$y=5,\ 25,\ 46,\ 67,\ 88,\ 109.$

N. B. Having found the greateſt value of either of the unknown quantities, the leaſt value thereof may be more readily obtained thus: Divide the greateſt value by the co-efficient of the other unknown quantity, and the remainder will be the leaſt value. Alſo the quotient $+1$ will be the number of anſwers.

This however ſuppoſes the co-efficients to be prime to each other; and, therefore, when they are not ſo, the Equation muſt be reduced by dividing by the greateſt common meaſure.

Quest. IV. The reckoning of a certain number of men and boys came to 23 ſhillings; to the defraying of which each man paid 3s. 6d. and each boy 1s. 6d. What number of men and boys were there in company?

Let $x=$ the number of men, and $y=$ the number of boys; then $7x+3y=46$ per queſtion, and $x=\frac{46-3y}{7}=6-\frac{3y+4}{7}=$ a whole number; and therefore $\frac{3y-4}{7}=$ a whole number; whence the leaſt value of y is 6, and conſequently the greateſt value of x is 4; and this, divided by 3 leaves a remainder of 1 for the leaſt value of x, and 13 is the correſponding value of y. Alſo the quotient $+1=2$, which ſhews that there are no more ways of paying the reckoning. But as the quotient ſuppoſes a plurality, both of men and boys, the two former numbers only can ſatisfy the demand. Hence, there were 4 men and 6 boys.

Quest. V. Required the leaſt integer, which being divided by 4, 5 and 6, there ſhall remain 1, 2 and 3, reſpectively.

Here let $x=$ the quotient by 4, then $4x+1$ will be the required number; and, by the ſecond condition of the queſtion $\frac{4x+1-2}{5}=\frac{4x-1}{5}=$ whole number; then by the lemma $x=4$; and $4x+1=17=$ the leaſt whole number that will anſwer the two firſt conditions. Now the leaſt whole number that is diviſible by 4 and 5, will (as they are prime to each other) $=4\times5=20$; then ſince the required number, by the nature of the queſtion, muſt be ſome multiple of 20 increaſed by 17, it is evident that it may be repreſented by $20y+17$; and this number, leſs 3, is alſo diviſible by 6; therefore $\frac{20y+17-3}{6}$ is a whole number, viz. $3y+2+\frac{2y+2}{6}=$, a whole number; and therefore $\frac{2y+2}{6}$ or $\frac{y+1}{3}=$ a whole number; and, by the lemma, the leaſt value of y is 2; and conſequently, $20y+17=57=$ the leaſt whole number; which being divided by 4, 5 and 6, reſpectively, will leave the given remainders 1, 2 and 3. In like manner the method may be extended to any number of diviſors and given remainders, by proceeding ſtep by ſtep, till a number is found that will anſwer the whole; and conſequently the ſame will be applicable in the ſolution of indeterminate Equations, where three, four, or more quantities, are concerned. But when the number of the unknown quantities exceed the number of Equations by more than one, the limits of the quantities muſt be found by Art. I. of this Section; and then the values of ſome unknown quantity muſt be aſſumed, at repeated operations, $=$ to the ſucceſſive numbers between its leaſt and greateſt limits; and ſo all the values of the reſt of the unknown quantities will be determined by the preceding methods; viz. for inſtance, if there be three unknown quantities in one Equation, and if it is found that a quantity cannot exceed 10, nor be leſs than 1, aſſume its value $=1$, and then the Equation will be reduced to two unknown quantities, to be determined as hath been already ſhewn. This done, aſſume its value, $=2$, and determine the reſt as before; then put 3 for its value, and ſo on, till all the numbers from its leaſt to its greateſt limits are exhauſted. The ſum of all the anſwers thus obtained, will exhibit all the poſſible ways by which the queſtion can be ſolved.

Art. III. *Of rational Square and Cube Numbers.*

For queſtions of the following nature no certain rule can be given, but the methods of ſolving them, as well as thoſe of ſome others that come under the laſt Article, reſt chiefly in the invention of the artiſt, whoſe penetration and ſagacity alone muſt ſuggeſt what ſteps will be requiſite to accompliſh the end of his enquiries. On this account we ſhall only lay down ſome general obſervations, with a few examples by way of illuſtration.

Obſervations on Square Numbers.

1ſt. All even ſquare numbers are diviſible by 4, and therefore if a number conſiſts of two even ſquare numbers, it will alſo be diviſible by 4.

2d. Any odd ſquare number, divided by 4, leaves a remainder of 1; and therefore, if a number, conſiſting of two odd ſquare numbers, be divided by 4, there will be a remainder of 2.

3d. It follows from the above, that if a number, conſiſting of an even and an odd ſquare number, be divided by 4, there will be a remainder of 1.

4th. Hence alſo, if any number which is compoſed of two ſquare numbers, be divided by 4, it cannot leave a remainder of 3; and conſequently a number, which is compoſed of two ſquare numbers, cannot fall within this progreſſion, 3, 7, 11, 15, 19, 23, &c.

5th. Any number ending in 2, 3, 7 or 8, is not a ſquare number.

6th. The ſum of any number of terms of the ſeries, 1, 3, 5, 7, 9, 11, &c. beginning with the firſt, is a ſquare number, whoſe root is equal to the number of terms.

7th. The difference between any two ſquare numbers is equal to the product of the ſum and difference of their roots. Thus if a and b be the Roots, then $a+b\times a-b=a^2-b^2$; and the ſame is alſo equal to the ſum of the two roots, together with twice the ſum of the roots of all the intermediate ſquare numbers. Thus the difference between 36 and $9=\overline{6+3}+2\times\sqrt{\overline{16+25}}=9+18-27$.

In attempting to ſolve queſtions of this claſs, the chief point in view is to make ſuch aſſumptions for the Root of the required ſquare or cube, as ſhall, when involved, cauſe either the given number, or the higher power of the unknown quantity, to vaniſh out of the Equation, whereby at length there will be only one dimenſion of the unknown quantity, and ſo the queſtion will be ſolved by reducing the Equation.

Examples.

Quest. I. What two ſquare numbers are thoſe, the difference whereof is 57? Here I try to divide 57 into two unequal integer factors, which in any caſe may be done if one of them is taken an unit. But here I find 3 and 19 will do. Hence as the rectangle of the ſum and difference of the roots is equal to the difference of the ſquares $=$ to the rectangle of 3 and 19, I conclude that the ſum of the two roots is 19, and the difference 3: then if $x=$ greateſt root, and $y=$ leſs, $x+y=19$, and $x-y=3$; and adding the two Equations together, and dividing by 2, we have $x=11$, and conſequently $y=8$; or, which is a well known theorem, half the ſum $+$ half difference $=$ greater number, and half ſum $-$ half difference $=$ leſs number. Hence the two ſquare numbers are 121 and 64 reſpectively. If an unit had been taken for one of the factors, then $\frac{56+1}{2}=29$ for the greater root, and $\frac{57-1}{2}=28$, the leſs root, and the ſquare numbers themſelves are 841 and 784 reſpectively, which likewiſe anſwer the conditions of the queſtion.

Scholium. In order to have the anſwer in whole numbers; if the given difference be an odd number, both the factors muſt be taken odd, which may always be done by means of an unit: and ſo it will always be a poſſible caſe. But if the propoſed difference be an even number, it muſt be divided into factors that are even, or the anſwer will not be had in whole numbers: when it is a poſſible caſe, one of the factors may be 2. By thus dividing the given difference into factors, all the poſſible anſwers will be readily exhibited. If fractional numbers are included, the anſwers will be innumerable.

Quest. I. To divide a given ſquare number (100) into two other ſquare numbers. Let the given ſquare number $(100)=b^2$ and put $x^2=$ one of its parts, ſo will $b^2-x^2=$ the other part, which is alſo a ſquare number. Aſſume this number alſo $=\overline{rx-b}|^2$; then theſe values being put equal to each other, and the Equation reduced, $x=\frac{2br}{r^2+1}$; and by ſubſtituting this in lieu of x in the aſſumed value of the other root, viz. $rx-b$, we have $\frac{br^2-b}{r^2+1}$. And hence $\frac{2br}{r^2+1}$, and $\frac{br^2-b}{r^2+1}$, are the roots of the required ſquares; where r may be any number (above 1) taken at pleaſure. Now if the value of b $(=10)$ be reſumed, and r be taken $=2$, the roots of the required ſquares will be 8 and 6 reſpectively; and conſequently the ſquare numbers are 64 and 36. If no value of r will give the anſwer in whole numbers, the given ſquare number is not compoſed of two integer ſquares.

Quest. III. To find a ſquare number, which if multiplied by a known ſquare number $(=9)$ and a given number (288) be added to the product, the reſult ſhall be a ſquare number. Put $9=a^2$; $288=d$; and $z^2=$ the required number. Then $a^2\ z^2+d=$ a ſquare number $(=y^2)$ per queſtion. Aſſume $v-az=y$, then $y^2=v^2-2vaz+a^2\ z^2$. Now, putting theſe two values of y^2 equal to each other, viz. $a^2\ z^2+d=v^2-2vaz+a^2\ z^2$, and reducing the Equation, we have $z=\frac{v^2-d}{2av}$, where v may be taken at pleaſure; but with this proviſion, if the anſwer is required in whole numbers, that v^2-d, will divide by $2av$. In the above Example take $v=24$, and reſume the values of a $(=3)$ and d $(=288,)$ and z is had $=2$; hence $z^2=4$, which number anſwers the demands of the queſtion.

Quest. IV. To divide a given number (25) conſiſting of two known ſquare numbers (16 and 9) into two other ſquare numbers.

Put $16=d^2$ and $9=b^2$, and aſſume $ra-d=$ ſide of one ſquare, and $sa-b=$ ſide of the other, then $\overline{ra-d}^2+\overline{sa-b}^2=d^2+b^2$ (per queſtion.) By involution and tranſpoſition $r^2\ a^2+s^2a^2=2rad+{}^2sab$; and dividing by $a\,r^2+as^2$, we have $a=\frac{2rad+2abs}{ar^2+s^2}=\frac{2rd+2bs}{r^2+s^2}$, and this ſubſtituted for a, in the aſſumed expreſſions, $ra-d$, and $sa-b$, they become $\frac{dr^2+2bsr-ds^2}{r^2+s^2}$, and $\frac{2rds+bs^2-br^2}{r^2+s^2}$ for the two roots of the ſquare numbers required. Now, if the values of d and b be reſumed, and r be taken $=2$, and $s=1$, we ſhall have $\frac{24}{5}$ and $\frac{7}{5}$ for the roots; and therefore $\frac{576}{25}$ and $\frac{49}{25}$ are the ſquare numbers required.

N. B. r and s may be any numbers whatever, provided r be greater than s, and that their ratio be not as that of d to b, or of $d+b$ to $d+-b$. In Ronayne's Algebra, through taking r leſs than s, and aſſuming $ra+b=$ one of the given ſides, the ſolution to this problem is wrong.

Quest. V. To find three cube numbers, whoſe ſum may be both a ſquare and cube number.

Put a, e and y, for their reſpective roots, and $x^6=$ ſum of their cubes; then $a^3+e^3+y^3=x^6$ per queſtion. Aſſume $\frac{x^4}{a^2}v-a=e$ and $x^2-v=y$; then $a^3+\overline{\frac{x^4}{a^2}v-a}\Big|^3+\overline{x^2-v}\Big|^3=x^5$; the compound parts of which Equation being involved, and then the whole properly reduced, v is found $=\frac{3a^2\quad x^2}{x^6+a^3}$ where x and a may be taken at pleaſure; and this value of v being ſubſtituted in the aſſumed values of e and y, above ſpecified, they will become known. If $x=1$, and $a=\frac{1}{2}$, then $v=\frac{1}{3}$, whence $e=\frac{5}{6}$, and $y=\frac{2}{3}$, and conſequently the cube numbers are $\frac{1}{8}$, $\frac{125}{216}$, and $\frac{8}{27}$, which fulfil the conditions of the queſtion, their ſum being ($=1$) both a ſquare and a cube number. And by taking different values for x and a, various anſwers may be obtained.

SECTION VII. OF THE MAXIMUM AND MINIMUM OF ALGEBRAIC QUANTITIES.

When a quantity is required to be the greateſt or leaſt poſſible, it is called a *maximum* or *minimum*. And at the time it becomes ſuch, it is at a ſtand, and at that moment neither increaſes or decreaſes. Therefore to compute it, obſerve this

Rule. Calculate the value of the maximum or minimum two different ways, which is done by increaſing the unknown quantity therein, by an exceeding ſmall part; then theſe values are to be put equal to one another. The ſame muſt be done, if there be ſeveral variable quantities. But go no farther than the firſt power of the ſmall added part. Or,

If the maximum or minimum conſiſts of two parts, compute the exceeding ſmall increment of one, and the decrement of the other; and put them equal to one another.

Examp. I. What Fraction is that whoſe Square exceeds its cube the greateſt poſſible.

Let x be the fraction, then $x^2-x^3=$ max. Take e an exceeding ſmall part to be added to x, then you will alſo have $\overline{x+e}^2-\overline{x+e}^3=max$. that is, $xx+2xe-x^3-3x^2e=max$. Whence $x^2-x^3=xx+2xe-x^3-3x^2e$, and $2xe-3x^2e=0$, or $3x^2e=2xe$, and $3x=2$, or $x=\frac{2}{3}$.

Or thus, ſince $x^2-x^3=max$. let e be the ſmall increaſe of x, then $2xe$ is the increment of xx, and $3x^2e$ is the decrement of x^3; therefore $2xe=3x^2e$, and $x=\frac{2}{3}$ as before.

Examp. II. To divide a given quantity into two parts that, one of the parts multiplied by the Cube of the other part, the product may be a Minimum.

Let a be the quantity, and x one part, and $a-x$ the other part, and e a ſmall additional part to x. Then $x^3\times\overline{a-x}$ or $ax^3-x^4=$ max. $=ax^3+3ax^2e-x^4-4x^3e$. Then $3ax^2e=4x^3e$, and $x=\frac{3}{4}a$, for one part, and $a-x=\frac{1}{4}a$, the other part.

Examp. III. To find $a^3-a^2x+x^3$ a Minimum, x being unknown.

Put $x+e$ for x. Then $a^3-a^2x+x^3=min.=a^3-a^2x-a^2e+x^3+3x^2e$, and $-a^2e+3x^2e=0$, and $3xx=aa$; whence $x=a\sqrt{\frac{1}{3}}$. Then $a^3-a^2x+x^3=a^3-a^3\sqrt{\frac{1}{3}}+\frac{1}{3}a^3\sqrt{\frac{1}{3}}=a^3\times\overline{1-\frac{2}{3}\sqrt{\frac{1}{3}}}$, the Minimum.

Examp. IV *Suppose* $y^3-2yyx+3yxx=nyx-xxx$, and $x-\frac{1}{2}y=$ *max.*

Suppoſe the maximum $=m$. Then $x=m+\frac{1}{2}y$. This ſubſtituted in the firſt Equation, and reduced, gives $\frac{1}{4}y^3+3m^2y=\frac{1}{4}nyy-mmm$. And $y^3+12mmy-nyy+4mmn=0$.— Where m is a fixt quantity. Put $y+e$ for y; then $y^3+12m^2y-nyy+4m^2n=0=y^3+3y^2e+12m^2y+12m^2e-ny^2-2nye+4m^2n=0$, and $3y^2e+12m^2e-2nye=0$, whence $3yy+12m^2-2ny=0$, or $2ny-3yy=12mm$. From this Equation, and $y^3+12m^2y-nyy+4m^2n=0$, the quantities y and m will eaſily be determined.

Article I.

Given the Sum of the Legs of a right-angled Triangle; to find the Legs, so as to contain the greatest Area possible.

Let $a=$ ſum of the legs, $x=$ one of them; then $x\times\overline{a-x}=$ twice the area $=$ max. therefore $\overline{x+e}\times\overline{a-x-e}=x\times\overline{a-x}$ that is, $ax-xx-xe+ae-xe=ax-xx$, and $ae-2xe=0$, or $2x=a$, whence $x=\frac{1}{2}a$, and $a-x=\frac{1}{2}a$. Therefore the legs are equal. And therefore when the area is given, the ſum of the legs will be the leaſt, when they are equal.

Article II.

Given the Area of a right-angled Triangle; to find the Sides, when the Perimeter is the least possible.

Let $a=$ area, $x=$ ſum of the legs, v, $y=$ the two legs; then $vv+yy+2vy=xx$, but $vy=2a$, and $vv+yy=xx-2vy=xx-4a$, and the hypothenuſe $=\sqrt{vv+yy}=\sqrt{xx-4a}$; therefore $x+\sqrt{xx-4a}=$ perimeter $=$ minimum, write $x+e$ for x; then $\sqrt{\overline{x+e}^2-4a}=\sqrt{xx+2xe-4c}=\sqrt{xx-4a}+\frac{xe}{\sqrt{xx-4a}}$; whence $x+e+\sqrt{xx-4a}+\frac{xe}{\sqrt{xx-4a}}=x+\sqrt{xx-4a}$, and $e+\frac{xe}{\sqrt{xx-4a}}=0$. And $e\sqrt{xx-4a}=-xe$, & $eexx-4aee=xxee$, & $4aee=0$, and $ee=\frac{0}{4a}$, or $e=0$. And therefore ſince the increment of x is nothing, x is a minimum; and when x or the ſum is a minimum, then the legs are equal, by the laſt Article; therefore $v=y=\frac{1}{2}x$, and $\frac{1}{4}xx=2a$, or $x=\sqrt{8a}$.

Art. III. *To find* x^m-x^n *the greatest possible, supposing* n greater than m.

Write $x+e$ for x, then $\overline{x=e}^m=x^m+mx^{m-1}e$, and $\overline{x+e}^n=x^n+nx^{n-1}e$; therefore $\overline{x+e}^m-\overline{x+e}^n=x^m-x^n$; that is, $x^m+mx^{m-1}e-x^n-nx^{x-1}e=x^m-x^n$. And by ſubtraction, $mx^{m-1}e-nx^{n-1}e=0$, or $mx^{m-1}=nx^{n-1}$. And n being greater than m, we have $nx^{n-m}=m$, and $x^{n-m}=\frac{m}{n}$ whence $x=\sqrt[n-m]{\frac{m.}{n}}$

Having treated of all the neceſſary fundamental parts of this Art, it only remains that we elucidate the ſame, by applying them to the ſolution of ſuch queſtions as occur in the different branches of mathematical education; at the ſame time informing the contributors to this undertaking, that many intereſting matters, wherein Algebra is applied, will be occaſionally interſperſed in the courſe of the Work under their proper heads.

SECTION VIII. ALGEBRAIC QUESTIONS.

Quest. I. What two numbers are thoſe, whereof the ſum is 108, and the proportion of the leſs to the greater as 5 to 7?

Let x=the great number ; then $108-x$=the leſs. And as $108-x : x :: 5 : 7$ per queſtion. This brought into an Equation by **Art.** III. Sect. V. we have $5x=756-7x$, and by tranſpoſing $7x$, there is $12x=756$: hence, by dividing by 12, $x=63$, the greater number ; and $108-63=45$, the leſs number.

Quest. II. There are three numbers in arithmetical progreſſion ; the common difference is 2 ; and the product of the ſaid numbers is 960. What are thoſe numbers ?

Let $x=$ the middle term of the progreſſion, and then $\overline{x+2}$, and $x-2$, will be the two other terms ; and $x\times\overline{x+2}\times\overline{x-2}=960$ per queſtion. The terms being actually multiplied, $x^3-4x=900$; which Equation, ſolved either by **Art.** X or XI. Sect. VI. gives $x=10$; and therefore the three numbers are 8, 10, and 12.

Question. III. A ſervant bought apples at 6 for a penny, and pears at 5 for two-pence. The number of apples and pears together were an hundred ; and the money given for them was 2s. 2d. I demand how many there were of each ſort ?

Let a=the number of apples ; then $100-a$ will be the number of pears ; and as 6 : 1d : : $a : \frac{a}{6}$ =price of the apples. Alſo, as 5 : 2d : : $100-a : \frac{200-2a}{5}$=price of the pears ; then $\frac{a}{6}+\frac{200-2a}{5}=$ 2s. 2d. (=26d.) per queſtion. This Equation, multplied by 30, we have $5a+1200-12a=780$. By tranſpoſition, $7a=1200-780=420$; and by diviſion, $a=60$, the number of apples ; and $100-60=40$, the number of pears.

Quest. IV. It is required to divide the number 128 into four ſuch parts, that if the firſt be added to 7, the ſecond ſubtracted from 7, the third multiplied by 7, and the fourth divided by 7, the reſults may be equal among themſelves.

Let v, x, y, and z, be the required parts. Then $v+7=x-7,=7y,=\frac{z}{7}$, per queſtion. And from the equality of the two firſt, $x=v+14$; from the equality of the firſt and third, $y=\frac{v+7}{7}$; and from the equality of the firſt and fourth, $z=\overline{v+7}\times7=7v+49$. Therefore (by collecting theſe together) $v+\overline{v+14}+\frac{v+7}{7}+\overline{7v+49}=128$. By collecting the terms and tranſpoſition, $9v+\frac{v+7}{7}=65$; and by multiplying this by 7, collecting the terms, tranſpoſing, and dividing, $v=7$; and hence $x=7+14=21$; $y=\frac{7+7}{7}=2$; and $z=\overline{7+7}\times7=98$; the ſeveral parts required.

Quest V. There are two cubical pieces of marble, and the ſide of one exceeds the ſide of the other by 3 inches, and the ſolid inches in both are 2457 inches. Of what length is the ſide of each cubical piece ?

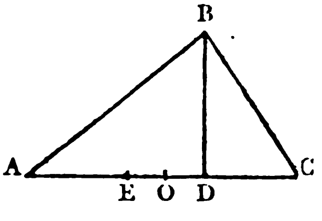
Let the ſide of the leſs be x, then the ſide of the greater will be $x+3$; and $x^3+\overline{x+3}^3=2547$ inches per queſtion.— Hence, $2x^3+9x^2+27x=2430$. This Equation ſolved, $x=9$, and conſequently, $y=12$.

Quest. VI. The ſum of two numbers multiplied by the greater is 110, and their difference multiplied by the leſs is 9, what are thoſe numbers ?

Put $110=a$, and $9=b$, and let x and y be the two numbers, whereof x is the greater ; then $\overline{x+y}\times x=x^2+xy=a$; and $\overline{x-y}\times y=xy-y^2=b$, per queſtion.

Again, Put $v=x^2$, & $z=y^2$; ſo will $v+\sqrt{vz}=a$, and $\sqrt{vz}-z=b$; and ſubtracting the latter Equation from the former $v+z=a-b$; hence $z=a-b-v$: by tranſpoſing the former Equation, $\sqrt{vz}=a-v$; and ſquaring both ſides, $vz=a^2-2av+v^2$. Then by ſubſtituting $a-b-v$, in lieu of z, the Equation becomes $av-bv-v^2=a^2-2av+v^2$; & by tranſpoſition and reduction, $v^2-\frac{\overline{3a-b}}{2}v=-\frac{a^2}{2}$. In numbers $v^2-160.5v=-6050$; & therefore $v=\sqrt{-6050+0440.0625}+80.25=\sqrt{390.0625}+80.25=19.75+80.25=100$, and $v^{\frac{1}{2}}=x=10$, the greater number : $z=a-b-v=110-9-100=1$; and therefore $z^{\frac{1}{2}}=1=y$, the leſs number.

Quest. VII. Let the ſides of the triangle ABC be as follow, viz. AB=24, AC=28, and BC=18 ; it is required to find the ſegments of the baſe AD and DC, made by a perpendicular let fall from B.



Take AE=DC, and divide AC into two equal parts as at O ; then becauſe AE=DC, ED= the difference of the ſegments ; and becauſe AO=OC, EO=OD=½ difference: alſo AO+OD=AD, the greater ſegment =OC+OD ; and OC—OD=DC=leſs ſegment.

Now put half difference of ſegments EO or OD=x, and let AB=a, BC=b, and AO or OC=½AC=c ; ſo will $c+x$=AD, and $c-x$=DC. Then, by the Pythagorean Theorem (ſee Geometry) $a^2-\overline{c+x}^2(=BD^2)=b^2-\overline{c-x}^2$; and therefore $a^2-c^2-2cx-x^2=b^2-c^2+2cx-x^2$; viz. $a^2=b^2+4cx$, or $a^2-b^2=4cx$; or, which is the ſame, $\overline{a+b}\times\overline{a-b}=4cx$. This reſolved into a proportion by Article III. Section V. we have as $2c : \overline{a+b} :: \overline{a-b} : 2x$; viz. as the baſe AC is to the ſum of the ſides AB and BC, ſo is the difference of thoſe ſides to ED the difference of the ſegments of the baſe: a well known Theorem in Trigonometry. Or by taking $4c$ for the firſt term, and x for the laſt, it will be as twice the baſe is to the ſum of the ſides ; ſo is the difference thereof to half the difference of the ſegments. Wherefore, in the preſent example, as (2AC) 56 : (AB+BC) 42 : : (AB—BC)6 : $\frac{42\times6}{56}=\frac{21\times6}{8}=\frac{21\times3}{14}=\frac{3\times3}{2}=4\frac{1}{2}$=½ difference of ſegments ; then

14 (AO or OC) $4\frac{1}{2}=18\frac{1}{2}=$AD, the greater ſegment; and $14-4\frac{1}{2}=9\frac{1}{2}=$DC, the leſs ſegment.

N. B. The greater ſegment is always adjacent to the greater remaining ſide, and the leſs ſegment is adjacent to the leſs remaining ſide.

QUEST. VIII. Having a conical veſſel full of liquor, ſtanding upon its leſs end, the radius of which is 20 inches, into which was immerſed a cone of equal baſe and altitude, the convex ſurface whereof is 2827.44, and is equal to the area of the top of the veſſel. Required its content, and the quantity of liquor in ale gallons that overflow by ſo doing. Let the top diameter of the veſſel be x, and its height y, $=$ alſo the height of the cone; and let $20=a$, and $2827.44=b$. Alſo put $.7854=p$; then $px^2=b$, per queſtion; and therefore $x^2=\frac{b}{p}$. But the reciprocal of $\frac{1}{p}=1.27324$, and therefore $x^2=1.27324\times b=3600$; and $x=\sqrt{3600}=60$ inches, the top diameter of the veſſel.

Alſo (per Menſuration) $\sqrt{\frac{a^2}{4}+y^2}=$the ſlant ſide of the cone, and $2pa\times\sqrt{\frac{a^2}{4}+y^2}=$ convex ſurface of the cone $=b$; therefore $\sqrt{\frac{a^2}{4}+y^2}=\frac{b}{2pa}$; and $\frac{a^2}{4}+y^2=\frac{b^2}{4p^2a^2}$; and conſequently $y^2=\frac{b^2}{4p^2a^2}-\frac{a^2}{4}$; and $y=\sqrt{\frac{b^2}{4p^2a^2}-\frac{a^2}{4}}=$ $\sqrt{4996.51\times\overline{1.27324}|^2}=\sqrt{4996.51\times1.62114}=\sqrt{8100}$. $=90$, the height of the veſſel, and altitude of the cone.

Then $\overline{\overline{20\times60}+20^2+60^2}\times\frac{9^0}{3}\times.7854=207345.6$ cubic inches, the content of the veſſel, $=735.27$ ale gallons. And $\overline{20}^2\times30\times.7854=9424.8$ cubic inches, the content of the cone,, $=33.42$ ale gallons, which overflowed by its immerſion.

QUEST. IX. Given the curve ſurface of the ſegment of a ſphere$=1600$, the difference between its ſolid content and that of a cylinder of the ſame diameter and altitude, $=1800$; to determine both the diameter and altitude. Let $z=\frac{1}{2}$ the diameter, and $x=$ the altitude, and let $7854=p$. Then $\overline{z^2+x^2}\times4p=$the curve ſurface of the ſegment, $=1600$ per queſtion. And $z^2+z^2=\frac{400}{p}$ Alſo, $\overline{3z^2+x^2}\times\frac{2px}{3}=$ its ſolidity; and $4pz^2x=$ the ſolidity of the cylinder. (Vide Menſuration.) Therefore $\overline{3z^2+x^2}\times\frac{2px}{3}-4pxz^2=1800$ (per queſtion.) Divide by $\frac{2p}{3}$, and $3z^2x+x^3-6xz^2=1800\times\frac{3}{2p}=\frac{2700}{p}$; or $x^3-3xz^2=\frac{2700}{p}$.

Now from the Equation above, viz. $z^2+x^2=\frac{400}{p}$, we have $z^2=\frac{400}{p}-x^2$, which, ſubſtituted in this laſt Equation, there is $x^3-\frac{1200x}{p}+3x^3=\frac{2700}{p}$, or (by reduction) $x^3-\frac{300x}{p}=\frac{675}{p}$. The reciprocal of $\frac{1}{p}=1.27324$. Therefore the Equation is $x^3-300\times1.27324x=675\times1.27324$; or $x^3-381.972x=859.437$, which cubic Equation, ſolved, $x=20.584548$ inches the altitude, and $z^2=\frac{400}{p}-x^2$ $=400\times1.27324-x^2=509.296-423.723616$, &c. $=85.572384$, &c. and $z=\sqrt{85.572384}$, &c. $=9.250534$, and $2z=18.501068$ inches, the required diameter.

QUEST. X. There is a cubical block of marble, whoſe ſide in inches is expreſſed by two digits; the ſuperficies of the block is equal to 864 times the ſum of the ſaid digits; and its ſolidity is equal to 576 times the ſquare of the ſum of the ſaid digits; required the dimenſions.

Let $x=$ the digit in the tens place, and $y=$ the digit in the place of units, then $10\,x+y=$ ſide of the cube, and $\overline{10x+y}|^2\times6=864\times\overline{x+y}$; or $\overline{10x+y}^2=144\times\overline{x+y}$. Alſo $\overline{10\,x+y}^3=576\times\overline{x+y}^2$ per queſtion; and multiplying theſe Equations croſswiſe, $\overline{10x+y}^2\times576\times\overline{x+y}^2=144\times\overline{x+y}\times\overline{10x+y}|^3$. Now dividing both ſides by $144\times\overline{x+y}\times\overline{10x+y}^2$, we have $x+y\times4=10x+y$, or $4x+4y=10x+y$, and by tranſpoſition $3y=6x$, and therefore $y=2x$. This being ſubſtituted for y in the former Equation $(\overline{10x+y}^2=144\times\overline{x+y})$ there is $\overline{10x+2x}|^2=144\times\overline{x+2x}$, or $144x^2=144\times3\,x$, and dividing by $144\,x$, we have $x=3$, and $y=2x=6$; and therefore the ſide of the cube is 36.

QUEST. XI. On what day in the year 1789 was the ſun's right aſcenſion equal to the complement of his declination, the obliquity of the ecliptic being 23° 28′?

Let radius$=1$, and the co-tangent of 23° 28′$=2.3035064=a$; alſo put $z=$ tangent of the declination. Then (per Trignometry) $\frac{1}{\sqrt{1+z^2}}=$ coſine of the declination $=$ ſine of the right aſcenſion. But (per ASTRONOMY) as $1:a::z:az=$ſine of the right aſcenſion. Therefore $az=\frac{1}{\sqrt{1+z^2}}$ and $a^2z^2=\frac{1}{1+z^2}$; by multiplication, $a^2z^2+a^2z^4=1$; and by diviſion, $z^4+z^2=\frac{1}{a^2}$. Hence (putting $x=z^2$) $x=\sqrt{\frac{1}{a^2}+\frac{1}{4}}\Big|-\frac{1}{2}=\sqrt{\frac{a^2+4}{4a^2}}-\frac{1}{2}=\frac{1}{2a}\sqrt{a^2+4}-\frac{1}{2}$; $=$ (by reſtoring the value of a, and extracting the root, &c.) $.1622811$; and $\sqrt{x}=z=\sqrt{.1622811}=.4028413=$tangent 21° 56′½, the ſun's declination, which, from the nature of the queſtion, muſt be north increaſing, and therefore it is anſwerable to the 31ſt of May, the ſun's right aſcenſion being equal to the complement of his declination.

QUEST. XII. It is required to find a ſeries of whole numbers, each term of which being divided by 14, ſhall leave a remainder of 4; divided by 50, ſhall leave a remainder of 30; divided by 85, ſhall leave a remainder of

45;

45; and alſo each term divided by 95, ſhall leave a remainder of 85; by a general method which may be applied to the ſolution of any other queſtion of the like nature. This was the Prize Queſtion in the *Gentleman's Diary* for the year 1789; to ſolve which, we ſhall firſt proceed to find the leaſt term in the ſeries.

Let $x=$ the quotient, when divided by 14. Then $14x+4=$ the required number. Alſo $\frac{14x+4-30}{50}=$ a whole number per queſtion $=\frac{7x-13}{25}$; now the leaſt value of y by the lemma delivered in Art. II. Sect. VII. is 9; which ſubſtituted in the above expreſſion $(14x+4)$ we have 130, which is the leaſt number that will anſwer the firſt two conditions.

Now it is plain that the number which will anſwer three of the conditions muſt be ſuch a one as will divide by 14 and 50, without a remainder, + 130. The leaſt number that will do this is 350, (ſee Section of Fractions in our new Syſtem of Arithmetic.) But as it may be ſome multiple thereof, let z be the multiple; ſo will $350z+130$ be the number; and $\frac{350z+130-45}{85}=$ a whole number per queſtion; $=\frac{70z+17}{17}=4z+1+\frac{2z}{17}$; and therefore $\frac{2z}{17}=$ a whole number; and becauſe 2 and 17 are prime to each other, the leaſt whole number for z is 17; this ſubſtituted in the foregoing expreſſion $(350z+130)$ it makes $5950+130=6080$, which is the leaſt number that will anſwer three of the conditions. Now the number that will anſwer all the conditions muſt be the ſum of this number, and ſome other that will divide both by 350 and 85, without a remainder. The leaſt number that will do this $=350\times17=5950$; but as it may be ſome multiple thereof, let $5950y+6080=$ the required number; and then $\frac{5950y+6080-85}{95}=$ a whole number per queſtion, $=\frac{1190y+1199}{19}=62y+63+\frac{12y+2}{19}$. Therefore $\frac{12y+2}{19}=$ a whole number; and the leaſt value of y, by the ſaid lemma, is 3, which ſubſtituted for y, we have the value of the leaſt number in the required ſeries $=17850+6080=23930$. Furthermore, the leaſt number that will divide by 5950 and 95 without a remainder $=5950\times19=113050$; by the continual addition of which, an arithmetical ſeries will be formed, exhibiting all the poſſible numbers that will ſatisfy the enquiry. Thus 23930, 136980, 250030, 363080, 476130, &c. *ad infinitum*, will, ſeverally, if divided by the propoſed numbers, 14, 50, 85, and 95, leave the given remainders 4, 30, 45, and 85, reſpectively. There are other ways of coming at the ſame thing; but we know of none ſo *clear*, ſo *general*, and ſo *eaſy*.

N. B. This queſtion was propoſed by Mr. Moſs, an able Mathematician; and among all the Solutions that were publiſhed the following year in the Gentleman's Diary, there was not one which had either the elegance or ſimplicity of this.

QUEST. XIII. To divide the Sum of Two given Cubes into Two other Cubes.

Let	1	x^3, y^3 be the cubes ſought; b^3, c^3, the given cubes.
aſſume	2	$x=b+v$
	3	$y=c-\frac{bb}{cc}v$
$2)^3$ 3	4	$x^3=b^3+3bbv+3bv^2+v^3$
$3)^3$ 2	5	$y^3=c^3-3bbv+\frac{3b^4}{c^3}v^2-\frac{b^6}{c^6}v$
4+5	6	$x^3+y^3=b^3+c^3+3bv^2+\frac{3b^4}{c^3}v^2+v^3-\frac{b^6}{c^6}v^3=b^3+c^3$, per queſt.
6 tr.	7	$3bv^2+\frac{3b^4}{c^3}v^2=\frac{b^6}{c^6}v^3-v^3$
$7\times\frac{c^6}{vv}$	8	$3bc^6+3b^4c^3=b^6v-c^6v$.
8÷	9	$v=\frac{b^3+c^3}{b^6-c^6}\times3bc^3=\frac{3bc^3}{b^3+c^3}$.

QUEST. XIV. To find Three ſuch Cube Numbers whoſe Sum may be both a Square and a Cube Number.

Let	1	a, e, y be their roots, x^6 the ſum of their cubes.	
per queſt.	2	$a^3+e^3+y^3=x^6$	
$2-y^3$	3	$e^3+y^3=x_6-a^3$	
aſſume	4	$\frac{x^4}{aa}v-a=e$	
	5	$xx-v=y$	
	6	$a^3=$ a cube	
$4)^3$ 3	7	$+\frac{x^{12}}{a^6}v^3-\frac{3x^8}{a^3}v^2+3x^4v-a^3$	$=x^6$ per Queſt.
$5)^3$ 3	8	$+x^6-3x^4v+3x^2v^2-v^3$	
6, 7, 8,	9	$\frac{x^{12}}{a^6}v^3-\frac{3x^8}{a^3}vv+3x^2v^2-v^3=0$.	
$9\times\frac{a^6}{vv}$	10	$x^{12}v-a^6v=\overline{x^8-x^2a^3}\times3a^3$.	
	11	$v=\frac{x^6-a^3}{x^{12}-a^6}\times3a^3x^2=\frac{3a^3xx}{x^6+a^3}$, where x and a may be taken at pleaſure; then v being known, e and y are known by ſtep 4 and 5.	
Suppoſe		If $x=1$, $a=\frac{1}{2}$, then $v=\frac{1}{3}$, whence $e=\frac{5}{6}$, $y=\frac{2}{3}$, and the numbers are $\frac{1}{8}+\frac{125}{216}+\frac{8}{27}=1$.	
or ſuppoſe		If $x=2$, $a=1$, then $u=\frac{12}{65}$, and $e=\frac{127}{65}$, $y=\frac{248}{65}$, and the numbers are $1+\frac{2048383}{274625}+\frac{15252992}{274625}=64$.	

That every part of this work ſhould be as extenſively uſeful as poſſible, we were deſirous of preſenting our readers with a complete Syſtem of Algebra; and for that reaſon, conſulted with ſuch of our literary friends as were beſt acquainted with the ſubject. The above Syſtem, has been recommended by Dr. John Kemp, Profeſſor of Mathematics and Natural Philoſophy of Columbia College, as containing a very juſt and comprehenſive view of the Science; and better adapted for a work of this kind, than any which he had heretofore ſeen.

ALGEBRAICAL. } 1. Relating to algebra ; 2. Con-
ALGEBRAIC. } taining operations of algebra.

ALGEBRAIST, *n. s.* a perſon that underſtands or practiſes the ſcience of algebra.

ALGERINES, the inhabitants of Algiers, a nation of pirates, who to the diſgrace of all the powers of Europe, have robbed and plundered the ſhips, and enſlaved and murdered the ſubjects, of every Chriſtian ſtate in Europe and America, for theſe two centuries paſt, excepting only thoſe of ſuch as have condeſcended to purchaſe their friendſhip or forbearance, by preſents. If ever a cruſade, or combination of powers, was juſtifiable againſt any people on earth, it would certainly be laudable to extirpate theſe miſcreants ; who live chiefly by the plunder and murder of the honeſt and induſtrious part of mankind. Theſe pirates, all along the ſea coaſt, are a mixture of different nations ; but chiefly Moors and Moriſcoes driven out of Catalonia, Arragon, and other parts of Spain. There are alſo great numbers of Turks among them, who come from the Levant to ſeek their fortunes, as well as multitudes of Jews and Chriſtians taken at ſea, who are brought hither to be ſold for ſlaves. The inland inhabitants of Algiers, diſtinguiſhed by the name of Berebers, are ſome of the moſt ancient inhabitants of the country ; and are ſuppoſed to be deſcended from the ancient Sabeans, that nation of robbers, who plundered the patriarch Job, and who are ſaid to have come to Algiers from Arabia Felix. But the moſt numerous inhabitants are the Moors and Arabians. The former are very ſtout and warlike, and ſkilful horſemen ; but ſo addicted to robbing, that one cannot ſafely travel along the country at a diſtance from the towns without a guard, or at leaſt a marabout or ſaint for a ſafeguard. For as they look upon themſelves to be the original proprietors of the country, and not only as diſpoſſeſſed by the reſt of the inhabitants, but reduced by them to the loweſt ſtate of poverty, they make no ſcruple to plunder all they meet by way of repriſal. The inhabitants, in general, have a pretty fair complexion ; they are robuſt and well proportioned. People of diſtinction wear their beards ; they have rich clothes made of ſilk, embroidered with flowers of gold, and turbans enriched with jewels. The Turks, who compoſe the military force, have great privileges, pay no taxes, are never publicly puniſhed, and rarely in private. The loweſt ſoldier domineers over the moſt diſtinguiſhed Moors at pleaſure. If he finds them better mounted than himſelf, he exchanges horſes without ceremony. The Turks alone have the privilege of carrying firearms. Some good qualities, however, diſtinguiſh them, in ſpite of this exceſs of deſpotiſm. They never game for money, not even for trifles ; and they never profane the Deity. They ſoon forget their private quarrels ; and after the firſt paroxyſm of reſentment is over, it is infamy for a Turk to keep in remembrance the injuries he has received. In this reſpect certainly they are leſs barbarous than other nations which boaſt of their civilization. See MOORS, and ALGIERS.

ALGEZIRA, or ALGEZIRAS, an ancient town of Andaluſia, in Spain, which has a ſea port, on the coaſt of the Straits of Gibraltar. The harbour is formed by two iſlands, which gave riſe to the Name, *Algezira* ſignifying an iſland in the Arabaic. It lies about 16 miles W. from Gibraltar. By this city the Moors entered in 713 ; and it was not recovered from them till 1344, after a very long ſiege, remarkable for being the firſt in which cannon were made uſe of. Long. 52. 38. E. Lat. 36. 14. N.

ALGIERS, a kingdom of Africa, now one of the ſtates of Barbary.—According to the lateſt and beſt computations, it extends 600 miles in length from E. to W. along the Barbary coaſt, but is very unequal in breadth ; ſome places being ſcarce 40 miles broad, and others upwards of 100. It lies between 65. 44. and 74. 44. E. Long. and extends from Lat. 36. 55. to 44. 50. N.—It is bounded on the North by the Mediterranean ; on the E. by the river Zaine, the ancient Tuſca, which divides it from Tunis ; on the W. by the Mulvya, and the Mountains of Trava, which ſeparate it from Morocco and Tafilet ; and on the S. by Mount Atlas, and the Zaara, or Numidian deſart.

ALGIERS, CLIMATE, SOIL, RIVERS, &c. OF. The climate of Algiers is in moſt places ſo moderate, that they enjoy a conſtant verdure ; the leaves of the trees being neither parched up by heat in ſummer, nor nipped by the winter's cold. They begin to bud in February : in April the fruit appears in its full bigneſs, and is commonly ripe in May. The melons have an exquiſite taſte, and the ſtems of the vines are ſo large, that a man can hardly graſp them with his arms ; and the bunches of grapes are 1½ feet long. The ſoil, however, is exceſſively various ; ſome places being very fertile in corn, fruits, &c. and others extremely hot, dry, and barren, on which account they are generally ſuffered to lie uncultivated by the inhabitants, who are very negligent. Theſe barren places, eſpecially ſuch as lie on the Southern ſide, and are at a great diſtance from the ſea, harbour vaſt numbers of wild creatures, as lions, tigers, buffaloes, wild boars, ſtags, porcupines, monkies, oſtriches, &c. On account of their barrenneſs, there are but few towns, and thoſe thinly peopled ; though ſome of them are ſo advantageouſly ſituated for trading with Biledulgerid and Negroland, as to drive a conſiderable traffic with them. The principal rivers are the Celef, the Gaudi, or Gaudel Barbar, the Haregol, the Hued-alquivir, the Ladag, the Mina, the Shellif, or Zilif, the Suf-Gemar, and the Zha or Ziz. Beſides theſe there are many others of leſs note ; of which, however, we do not find that the Algerines avail themſelves as they might do, their genius leading them too much to the piratical trade to mind any real advantage that might be derived from their own country.

ALGIERS, HISTORY OF. The Algerine kingdom made formerly a conſiderable part of the Mauritania Tingitana (See MAURITANIA), which was reduced to a Roman province by Julius Cæſar, and from him alſo called *Mauritania Cæſarienſis*. After the Romans had been driven out of Arabia by the Vandals, and the latter by the Saracens about the middle of the ſeventh century ; the Arabs continued maſters of the country, divided into petty kingdoms under chiefs of their own chooſing, until the year 1051, when Abubeker ben Omar, or, as the Spaniſh authors call him, *Abu Texeſien*, provoked at the tyranny of thoſe deſpots, gathered, by the help of his marabouts or ſaints, a powerful army of malcontents, in Numidia and Libya. His followers were named *Morabites*, by the Spaniards, *Almoravides*, probably from their being aſſembled principally by the Mahometan ſaints ſo called. The khalif of Kayem's forces were at this time taken up in quelling revolts in Syria, Meſopotamia, &c. and the Arabs in Spain engaged in the moſt bloody wars; ſo that Texeſien, having nothing to fear from them, had all the ſucceſs he could wiſh againſt the Arabian cheyks, whom he repeatedly defeated and at laſt drove out of Numidia, Libya, and all the weſtern parts, reducing the whole province of Tingitania under his dominion. He was ſucceeded by his ſon Yuſef, or Joſeph, who laid the foundation of Morocco, which he deſigned for the capital of his empire. While that city was building, he ſent ambaſſadors to Tremecen, at that time inhabited by a powerful ſect of Mahometans called *Zeneti;* propoſing to bring them back to what he called the *true faith;* but the Zeneti, deſpiſing his offers, murdered his ambaſſadors, and invaded his dominions with an army of 50,000 men; whereupon he immediately led his army into their country, deſtroying all before him with fire and ſword; while the Zeneti, inſtead of oppoſing his progreſs, retired as faſt as poſſible towards Fez, in hopes of aſſiſtance. But in this they were miſerably deceived, for the Fezzans coming up with the unhappy Zeneti, encumbered with their families and baggage, and ready to expire with hunger and wearineſs, cut them all to pieces, except a ſmall number who were either drowned in attempting to ſwim acroſs a river, or periſhed by falling from the adjacent rocks. Mean time Joſeph reduced their country to a mere deſart; but it was ſoon repeopled by a numerous colony of Fezzans, who ſettled there. In this war it is computed that near a million of the Zeneti, men, women, and children, loſt their lives. Notwithſtanding the aſſiſtance Joſeph had thus received from the Fezzans, he declared war againſt them, reduced them to become his tributaries, and extended his conqueſt all along the Mediterranean. He next attacked thoſe Arabian cheyks who had not yet ſubmitted, taking many caſtles and fortreſſes, till then deemed impregnable; and at laſt completely ſubdued them. Thus was founded the empire of the Morabites, which, however, was of no long duration; that race being in the 12th century driven out by Mohavedin, a marabout. This race of prieſts was expelled by Abdulac, governor of Fez; and he, in the 13th century, was ſtripped of his conqueſts by the Sharifs of *Huscen*, the deſcendants of thoſe Arabian princes whom Abu Texeſien had formerly expelled. The better to ſecure their new dominions, the Sharifs divided them into ſeveral little kingdoms or provinces; and among theſe the preſent kingdom of Algiers was divided into four, *viz. Tremecen, Tenez, Algiers proper,* and *Bujeyah.* The four firſt monarchs laid ſo good a foundation for a laſting balance of power between their little kingdoms, that they continued for ſome centuries in mutual amity; but at length the king of Tremecen having ventured to violate ſome of their articles, Abul Farez, king of Tenez, declared war againſt him, and obliged him to become his tributary. This king dying ſoon after, and having divided his kingdom among his three ſons, new diſcords aroſe; which Spain, taking advantage of, ſent a powerful fleet and army againſt Barbary, in 1505, under the Count of Navarre, who took Oran, Bujeyah, and ſome other important places; which ſo alarmed the Algerines, that they put themſelves under the protection of Selim Eutemi, an Arabian prince. He came to their aſſiſtance with a great number of his braveſt ſubjects, but was not able to prevent the Spaniards from landing a number of forces near Algiers, and making the Algerines tributary to Spain; or from building a ſtrong fort on a ſmall iſland oppoſite to the city, which terrified their corſairs from ſailing either in or out of the harbour. They continued under this yoke till 1516; when, hearing of the death of Ferdinand king of Spain, they ſent to *Aruch Barbaroſſa*, who was at this time no leſs dreaded for his valour than his ſurpriſing ſucceſs, requeſting him to come and free them from the Spaniſh yoke; and offering him a gratuity anſwerable to ſo great a ſervice. Upon this Barbaroſſa immediately diſpatched 18 galleys and 30 barks to the aſſiſtance of the Algerines; while he himſelf advanced towards the city with 800 Turks, 3000 Jigelites, and 2000 Mooriſh volunteers. In his road to Algiers, he ſurpriſed *Haſſan*, another famed corſair, and obliged him to ſurrender; not without a previous promiſe of friendſhip: but no ſooner had Barbaroſſa got him in his power, than he cut off his head, and obliged all Haſſan's Turks to follow him in his new expedition. On Barbaroſſa's approach to Algiers, he was met by prince Selim, attended by the people who looked for deliverance from this abandoned villain, whom they accounted invincible. He was conducted into the city amidſt their acclamations, and lodged in one of the nobleſt apartments of prince Eutemi's palace, where he was treated with the greateſt marks of honour. Elated beyond meaſure with this kind reception, Barbaroſſa formed a deſign of becoming king of Algiers; and fearing oppoſition from the inhabitants, on account of the exceſſes he ſuffered his ſoldiers to commit, murdered prince Eutemi, and cauſed himſelf to be proclaimed king; his Turks and Moors crying out as he rode along the ſtreets, "Long live king Aruch Barbaroſſa, the invincible king of Algiers, the *choſen of God*, to deliver the people from the *oppreſſion* of the Chriſtians; and deſtruction to all that ſhall oppoſe, or refuſe to own him as their lawful ſovereign." This laſt threatening ſo intimidated the inhabitants already apprehenſive of a general maſſacre, that he was immediately acknowledged king. The unhappy princeſs Zaphira, Selim's queen, poiſoned herſelf, to avoid the brutality of this tyrant, whom ſhe unſucceſsfully endeavoured to ſtab with a dagger. After this, Barbaroſſa treated his ſubjects with ſuch cruelty, that they uſed to ſhut up their houſes and hide themſelves when he appeared in public. A plot was formed againſt him, but being diſcovered, he cauſed 20 of the principal conſpirators to be beheaded, and their bodies to be buried in a dunghill, and laid a heavy fine on thoſe who ſurvived; which ſo terrified the Algerines, that they never afterwards attempted any thing againſt him. Mean time, the ſon of prince Selim, having fled to Oran, and put himſelf under the protection of the marquis of Gomarez, laid before that nobleman a plan for putting the city of Algiers into the hands of the king of Spain. Upon this, young Selim Eutemi was ſent to Spain, to lay his plan before the cardinal Ximenes; who having approved of it, ſent a fleet with 10,000 land forces, under the command of *Don Diego de Vera*, to drive out the Turks, and reſtore the young prince. But the fleet was no ſooner come within ſight of land, than it was diſperſed by a ſtorm, and the greateſt part of the ſhips daſhed againſt the rocks. Moſt of the Spaniards were drowned; and the few who eſcaped were either killed by the Turks or made ſlaves. The reſt of the hiſtory of this bloody tyrant being one continued ſcene of enormity, it is only neceſſary to add that, after taking and plundering Tenez, and being choſen king of Tremecen, by the inhabitants, who were diſpleaſed with their own ſovereign, but whom he ſoon made to repent of the change, he was at laſt killed, by Abuchen-men, king of Tremecen, aſſiſted by the Spaniards, in the 44th year of his age, and 2d of his reign over Algiers. Although the news of Barbaroſſa's death ſpread the utmoſt conſternation among the Turks at Algiers, they proclaimed his brother Hayradin king; and the Spaniſh commander, having ſent back the emperor's forces, without making any attempt upon Algiers, he loſt the opportunity of driving the Turks out of that country; while Hayradin, juſtly dreading the conſequences of the tyranny of his officers, ſought the protection of the Grand Seignor. This was readily granted, and himſelf appointed baſhaw or viceroy of Algiers; by which means he received ſuch reinforcements, that the Algerines durſt not make the leaſt complaint; and ſuch numbers of Turks reſorted to him, that he became not only capable of keeping the Moors and Arabs in ſubjection at home, but of annoying the Chriſtians at ſea. His firſt ſtep was to take the Spaniſh fort of Calan, which was a great nuiſance to his metropolis, and though the Spaniards held out to the laſt extremity, he ſoon became maſter of it. He next ſet about building a ſtrong mole for the ſafety of his ſhips. In this he employed 30,000 Chriſtian ſlaves, whom he obliged to work without intermiſſion for three years; in which time the work was completed. He then cauſed the fort he had taken to be repaired, and placed a ſtrong garriſon in it, to prevent any foreign veſſels from entering the harbour without giving an account of themſelves. By theſe two important works, Hayradin ſoon became dreaded not only by the Arabs and Moors, but alſo by the maritime Chriſtian powers, eſpecially the Spaniards. The Grand Seignor having ſent him a freſh ſupply of money, he was enabled to erect batteries on all places that might favour the landing of an enemy. All theſe have ſince received greater improvements from time to time, as often as there was occaſion. Mean time the Sultan, either from a ſenſe of the great ſervices Hayradin had done, or out of jealouſy leſt he ſhould make himſelf independent, raiſed Hayradin to the dignity of baſhaw of the empire, and appointed Haſſan Aga, a Sardinian renegado, and an experienced officer, to ſucceed him as baſhaw of Algiers. Haſſan had no ſooner taken poſſeſſion of his new government, than he began to purſue his ravages on the Spaniſh coaſt with greater fury than ever; extending them to the eccleſiaſtical ſtate, and other parts of Italy: whereupon Pope Paul III. exhorted the emperor Charles V. to ſend a powerful fleet to ſuppreſs thoſe cruel piracies; and, that nothing might be wanting to render the enterpriſe ſucceſsful, a bull was publiſhed, wherein a plenary abſolution of ſins, and the crown of martyrdom, were promiſed to all who ſhould either fall in battle or be made ſlaves. The emperor on his part needed no ſpur; and therefore ſet ſail with a fleet of 120 ſhips and 20 gallies, having on board 30,000 choſen troops, and an immenſe quantity of money, arms, ammunition, &c. In this expedition many young nobility and gentry attended as volunteers, and many knights of Malta, ſo remarkable for their valour againſt the enemies of Chriſtianity. Even ladies of birth and character attended Charles in his expedition, and the wives and daughters of the officers and ſoldiers followed them, with a deſign to ſettle in Barbary after the conqueſt was finiſhed. The Algerines were greatly alarmed by this prodigious armament. The city was defended only by a wall, with ſcarce any outworks. The whole garriſon conſiſted of 800 Turks and 6000 Moors, without fire-arms, and poorly diſciplined and accoutred; the reſt of their forces being diſperſed in the other provinces of the kingdom, to levy the uſual tribute on the Arabs and Moors. The Spaniards landed without oppoſition, and immediately built a fort, under the cannon of which they encamped, and diverted the courſe of a ſpring which ſupplied the city with water. Being now reduced to the utmoſt diſtreſs, Haſſan was on the point of ſurrendering, when advice was brought him that the forces belonging to the weſtern government were in full march towards the place; upon which it was reſolved to defend it to the utmoſt. Charles, in the mean time, reſolving upon a general aſſault, kept a conſtant firing upon the town; which, from the weak defence made by the garriſon, he looked upon as already his own. But while the *douwan*, or Algerine ſenate, were deliberating on the moſt proper means of obtaining an honourable capitulation, a mad prophet, named *Yuſeff*, attended by a multitude of people, entered the aſſembly, and foretold the ſpeedy deſtruction of the Spaniards before the end of the moon, exhorting the inhabitants to hold out till that time. This prediction was ſoon accompliſhed in a very ſurpriſing manner: for, on the 28th of October, 1541, a dreadful ſtorm of wind, rain, and hail, aroſe from the north, accompanied with violent ſhocks of earthquakes, and an univerſal darkneſs, ſo that the elements ſeemed to combine together for the deſtruction of the Spaniards. In that night, ſome ſay in leſs than half an hour, 86 ſhips and 15 gallies were deſtroyed, with all their crews and military ſtores; by which the army on ſhore was deprived of all means of ſubſiſting in theſe parts. Their camp alſo, which ſpread itſelf along the plain under the fort, was laid quite under water by the torrents which deſcended from the neighbouring hills. Many of the troops, trying to remove into ſome better ſituations, were cut in pieces by the Moors and Arabs; while ſeveral galleys, and other veſſels, endeavouring to gain ſome neighbouring creeks along the coaſts, were immediately plundered, and their crews maſſacred by the inhabitants. Next morning Charles beheld the ſea covered with the fragments of ſo many ſhips, and the bodies of men, horſes, and other creatures, ſwimming on the waves; at which he was ſo diſheartened, that abandoning his tents, artillery, and all his heavy baggage, to the enemy, he marched at the head of his army, though in no ſmall diſorder, towards cape *Mulubux*, in order to reimbark in thoſe few veſſels which had outweathered the ſtorm. But Haſſan, who watched his motions, allowed him juſt time to get to the ſhore, when he attacked the Spaniards in the midſt of their hurry to get into their ſhips, killing great numbers, and bringing away a ſtill greater number of captives; after which he returned in triumph to Algiers, where he celebrated his happy deliverance with great rejoicings. In this unfortunate expedition upwards of 120 ſhips and galleys were loſt, above 300 land and ſea officers, 8000 ſoldiers and marines, beſides theſe deſtroyed by the enemy on the reimbarkation, or drowned in the laſt ſtorm. The number of priſoners was ſo great, that the Algerines ſold ſome of them, by way of contempt, for an onion per head. Charles himſelf eſcaped with difficulty to Tunis with his few remaining followers. Haſſan afterwards made his ally the king of Tremecen tributary, and returning to Algiers, laden with riches, ſoon after died of a fever, in the 66th year of his age. From this time the Spaniards were never able to annoy the Algerines in any conſiderable degree. In 1555, they loſt the city of Bujeyah, which was taken by *Salba Rais*, Haſſan's ſucceſſor, who dying ſoon after of the plague, the Algerine ſoldiers choſe a Corſican renegado, Haſſan Corſo, in his room, till they ſhould receive farther orders from the Porte. He did not accept of the baſhawſhip without a good deal of difficulty; and he had hardly enjoyed his dignity 4 months, before news came, that 8 galleys were bringing a new baſhaw to ſucceed him; one *Tekelli*, a principal Turk of the Grand Seignor's court: upon which the Algerines unanimouſly reſolved not to admit him. By the treachery of the Levantine ſoldiers, however, he was admitted at laſt, and the unfortunate Corſo thrown over a wall in which a number of hooks were fixed; one of which catching the ribs of his right ſide, he hung three days in the moſt exquiſite torture before he expired. Tekelli was no ſooner entered upon his new government, than he behaved with ſuch cruelty and rapacity, that he was aſſaſſinated even under the dome of a ſaint, by Yuſef Calabres, the favourite renegado of Haſſan Corſo; who for this ſervice was unanimouſly choſen baſhaw, but died of the plague ſix days after his election. Yuſef was ſucceeded by Haſſan, the ſon of Hayradin, who had been formerly recalled from his baſhawſhip, when he was ſucceded by Selha-Rais; and now had the good fortune to get himſelf reinſtated in his employment. Next year, the Spaniards undertook an expedition againſt Moſtagan, under the command of the count d'Alcandela; but were defeated, their commander killed, and 12,000 taken priſoners. Haſſan having diſobliged his ſubjects by allowing the mountaineers of Cuco to buy ammunition at Algiers, was ſent in irons to Conſtantinople, while the aga of the Janiſſaries ſupplied his place.—Haſſan found means to clear himſelf; but a new baſhaw was appointed, called Achmet; who was no ſooner arrived, than he ſent the two deputy baſhaws to Conſtantinople, where their heads were ſtruck off.—Achmet was a man of inſatiable avarice, and had bought his dignity by the money he had amaſſed while head gardener to the Sultan. He enjoyed it, however, only 4 months; and after his death, the ſtate was governed other 4 months by his lieutenant; when Haſſan was a third time ſent viceroy to Algiers, where he was received with the greateſt demonſtrations of joy. The firſt enterpriſe in which Haſſan engaged, was the ſiege of Marſalquiver, near Oran. His army conſiſted of 26,000 foot and 10,000 horſe; and his fleet of 32 galleys and galliots, together with three French veſſels laden with proviſions. The city was defended by Don Martin de Cordova, brother of the Count d'Alcandela, who had been taken priſoner in the battle where that nobleman was killed, but had obtained his liberty from the Algerines with immenſe ſums, and now made a moſt gallant defence againſt the Turks. The city was attacked with the utmoſt fury by ſea and land, ſo that ſeveral breaches were made in the walls. The Turkiſh ſtandards were ſeveral times planted on the walls, and as often diſlodged; but the place muſt have in the end ſubmitted, had not Haſſan been obliged to raiſe the ſiege, on hearing that the famed Genoeſe admiral Doria, was approaching with ſuccours from Italy. The fleet accordingly arrived ſoon after; but miſſing the Algerine gallies, bore away for Pennon de Velez, where they were ſhamefully repulſed by a few Turks who garriſoned that place; which, however, was taken the following year. In 1567, Haſſan was again recalled to Conſtantinople, where he died three years after. He was ſucceeded by Mahomet, who gained the love of the Algerines by ſeveral public ſpirited actions. He incorporated the Janiſſaries and Levantine Turks together, and by that means put an end to their diſſenſions, which laid the foundation of the Algerine independency on the Porte. He likewiſe added ſome conſiderable fortifications to the city and caſtle, which he deſigned to render impregnable. But while he was thus ſtudying the intereſt of Algiers, one John Gaſcon, a bold Spaniſh adventurer, formed a deſign of burning the whole piratic navy in the bay; but this plan, though patroniſed by king Philip II. proved abortive, owing to the dampneſs or improper mixture of the fire-works, and Gaſcon himſelf, being taken priſoner, was ſlain by the Algerines. Mahomet, being ſoon after recalled, was ſucceeded by the famous renegado Ochali, who reduced the kingdom of Tunis; which, however, remained ſubject to the viceroy of Algiers only till the year 1586, when a baſhaw of Tunis was appointed by the Porte.

ALGIERS, HISTORY OF, *governed by its own Deys.* Algiers continued to be governed, till the beginning of the 17th century, by viceroys appointed by the Porte; concerning whom we find nothing very remarkable, further than that their avarice and tyranny were intolerable both to the Algerines and the Turks. At laſt the Turkiſh Janiſaries and militia becoming powerful enough to ſuppreſs the tyrannic ſway of theſe baſhaws, and the people being almoſt exhauſted by the heavy taxes laid upon them, the former reſolved to depoſe theſe petty tyrants, and ſet up ſome officers of their own at the head of the realm. The better to ſucceed in this attempt, the militia ſent a deputation of ſome of their chief members to the Porte, to complain of the oppreſſion of theſe baſhaws, who ſunk both the revenue of the ſtate, and the money remitted to it from Conſtantinople, into their own coffers, which ſhould have been employed in keeping up and paying the ſoldiery; by which means they were in continual danger of being overpowered by the Arabians and Moors, who, if ever ſo little aſſiſted by any Chriſtian power, would hardly fail of driving all the Turks out of the kingdom. They repreſented to the Grand Vizier how much more honorable, as well as eaſier and cheaper, it would be for the Grand Seignor to permit them to chooſe their own dey, or governor, from among themſelves, whoſe intereſt it would then be to ſee that the revenue of the kingdom was rightly applied in keeping up its forces complete, and in ſupplying all other exigencies of the ſtate, without any farther charge or trouble to the Porte than that of allowing them its protection. On their part, they engaged always to acknowledge the Grand Seigniors as their ſovereigns, and to pay their uſual allegiance and tribute, to reſpect their baſhaw, and even to lodge and maintain them and their retinue, in a manner ſuitable to their dignity, at their own charge. The baſhaws, however, were, for the future.

ture, to be excluded from aſſiſting at any but general douwans, unleſs invited; and from having the liberty of voting in them, unleſs when their advice was aſked, or the intereſt of the Porte was likely to ſuffer by their ſilence. All other concerns, which related to the government of Algiers, were to be wholly left under the direction of the dey and his douwan. The propoſals having been accepted by the Porte, his deputies returned highly ſatisfied; and having notified their new privileges, the great douwan immediately proceeded to the election of a dey from among themſelves. They compiled a new ſet of laws, and made ſeveral regulations for the better ſupport and maintenance of this new form of government, to the obſervation of which they obliged all their ſubjects to ſwear; and the militia, navy, commerce, &c. were all ſettled pretty nearly on the footing upon which they now are, and which ſhall be afterwards deſcribed; though the altercations that happened between the baſhaws and deys, the one endeavouring to recover their former power, and the other to curtail it, cauſed ſuch frequent complaints at the Ottoman court, as made them often repent their compliance. In 1601, the Spaniards, under Doria, the Genoeſe admiral, made another attempt upon Algiers, in which they were more fortunate than uſual, their fleet being only driven back by contrary winds, ſo that they came off without loſs. In 1609, the Moors being expelled from Spain, flocked in great numbers to Algiers; and as many of them were very able ſailors, they undoubtedly contributed to make the Algerine fleet ſo formidable as it became ſoon after. In 1616, it conſiſted of 40 ſail, of between 200 and 400 tons, their admiral 500 tons. It was divided into two ſquadrons, one of 18 ſail, before the port of Malaga; and the other at the Cape of Santa Maria, between Liſbon and Seville; both of which fell foul on all Chriſtian ſhips, both Engliſh and French, with whom they pretended to be in friendſhip, as well as Spaniards and Portugueſe, with whom they were at war. The Algerines were now become very formidable to the European powers. The Spaniards, who were moſt in danger, and leaſt able to cope with them, ſolicited the aſſiſtance of England, Rome, and other ſtates. The French, however, were the firſt who dared to ſhew their reſentment of the perfidious behaviour of theſe miſcreants; and in 1617, M. Beaulieu was ſent againſt them with a fleet of 50 men of war, who defeated their fleet, took two of their veſſels, while their admiral ſunk his own ſhip and crew, rather than fall into his hands. In 1620, a ſquadron of Engliſh men of war was ſent againſt Algiers, under Sir Robert Manſel: but it returned without doing any thing; and the Algerines, becoming more and more inſolent, openly defied all the European powers, the Dutch only excepted; to whom, in 1625, they ſent a propoſal, directed to the prince of Orange, that in caſe they would fit out 20 ſail of ſhips the following year, upon any good ſervice againſt the Spaniards, they would join them with 60 ſail of their own. Next year, the *Coulolies*, or *Cologlies* (the children of ſuch Turks as had been permitted to marry at Algiers) who were enrolled in the militia, having ſeized on the citadel, had well nigh made themſelves maſters of the city; but were attacked by the Turks and renegadoes, who defeated them with terrible ſlaughter. Many of them were executed; and their heads thrown in heaps upon the city walls, without the city gate. Part of the citadel was blown up; and the remaining Coulolies were diſmiſſed from the militia, to which they were not again admitted till long after.

ALGIERS, HISTORY OF, IN ITS INDEPENDENT STATE. In 1623, Amurath IV. having made a truce for 25 years, with the emperor Ferdinand II. the Algerines and other ſtates of Barbary threw off their dependence on the Porte altogether, and ſet up for themſelves; and reſolved, that whoever deſired to be at peace with them muſt apply to their government. They accordingly began to make prizes of ſeveral merchant ſhips belonging to powers at peace with the Porte; and having ſeized a Dutch ſhip and polacre at Scanderoon, they ventured on ſhore; and finding the town abandoned by the Turkiſh aga and inhabitants, they plundered all the magazines and warehouſes, and ſet them on fire. About this time Lewis XIII. undertook to build a fort on their coaſts, inſtead of one formerly built by the Marſilians, and which they had demoliſhed. This, after ſome difficulty, he accompliſhed; and it was called the Baſtion of France: but the ſituation being afterwards found inconvenient, the French purchaſed the port of La Calle, and obtained liberty to trade with the Arabians and Moors. The Ottoman court, in the mean time, was ſo much embarraſſed with the Perſian war, that there was no leiſure to check the Algerine piracies. This gave an opportunity to the vizir and other courtiers to compound matters with the Algerines, and to get a ſhare of their prizes, which were very conſiderable. However, for form's ſake, a ſevere reprimand, accompanied with threats, was ſent them; to which they replied, that "theſe depredations deſerved to be indulged to them, ſeeing they were the only bulwark againſt the Chriſtian powers, eſpecially againſt the Spaniards, the ſworn enemies of the Moſlem name;" adding, that "if they ſhould pay a punctilious regard to all that could purchaſe peace, or liberty to trade with the Ottoman empire, they would have nothing to do but ſet fire to all their ſhipping, and turn camel drivers for a livelihood." The Algerines continued to proſecute their piracies with impunity, to the terror and diſgrace of the Europeans, till the year 1652: when a French fleet being accidentally driven to Algiers, the admiral took it into his head to demand a releaſe of all the captives of his nation, without exception. This being refuſed, the Frenchman without ceremony carried off the Turkiſh viceroy, and his cadi or judge, who were juſt arrived from the Porte, with all their equipage and retinue. The Algerines, by way of repriſal, ſurpriſed the Baſtion of France, already mentioned, and carried off the inhabitants to the number of 600, with all their effects; which ſo provoked the admiral, that he ſent them word, he would pay them another viſit next year with his whole fleet. The Algerines, undiſmayed by his threats, fitted out a fleet of 16 galleys and galliots, excellently manned and equipped, under the command of Admiral Hali Pinchinin. The chief deſign of this armament was againſt the treaſure of Loretto; which, however, they were prevented by contrary winds from obtaining.—Upon this they made a deſcent on Naples, where they ravaged the whole territory of Necctra, carrying off a vaſt number of captives, and among them ſome nuns. From thence ſteering towards Dalmatia, they ſcoured the Adriatic; and loading themſelves with immenſe plunder, left thoſe coaſts in the utmoſt conſternation. At laſt the Venetians, alarmed at ſuch terrible depredations, equipped a fleet of 28 ſail, under the command of admiral Capello, with expreſs orders to burn, ſink, or take, all the Barbary corſairs he met with, either on the open ſeas, or even in the Grand Seignior's harbours, purſuant to a late treaty of peace with the Porte. The captain baſhaw, who had been ſent out with the Turkiſh fleet, to chaſe the Florentine and Malteſe cruiſers out of the Archipelago, underſtanding that the Algerine ſquadron was ſo near, ſent orders to the admiral to come to his aſſiſtance. Pinchinin readily agreed; but having firſt reſolved on a deſcent upon the iſland of Liſſa, belonging to the Venetians, he was overtaken by Capello, from whom he retired to Valona, a ſea port belonging to the Grand Seignior, whither the Venetian admiral purſued him; but the Turkiſh governor refuſing to eject the pirates according to the articles of the peace between the Ottoman court and Venice, Capello was obliged to content himſelf with watching them for ſome time. Pinchinin at laſt ventured out, when an engagement immediately enſued, in which the Algerines were defeated, and five of their veſſels diſabled; with the loſs of 1500 men, Turks and Chriſtian ſlaves; beſides 1600 galley ſlaves who regained their liberty. Pinchinin, after this defeat, returned to Valona, where he was again watched by Capello; but the latter had not lain long at his old anchorage, before he received a leter from the ſenate, deſiring him to make no farther attempt on the pirates at that time, for fear of a rupture with the Porte. This was followed by a letter from the governor of Valona deſiring him to take care leſt he incurred the Sultan's diſpleaſure by ſuch inſults.—The brave Venetian was forced to comply; but, reſolving to take ſuch leave of the Algerines as he thought they deſerved, obſerved how they had reared their tents, and drawn their booty and equipage along the ſhore. He then kept firing among their tents, while ſome well manned galliots and brigantines were ordered among their ſhipping, who attacked them with ſuch bravery, that, without any great loſs, they towed out their 16 galleys, with all their cannon, ſtores, &c. In this laſt engagement, a ball from one of the Venetian galleys happening to ſtrike a Turkiſh moſque, the whole action was conſidered as an inſult upon the Grand Seignior. To conceal this, Capello was ordered to ſink all the Algerine ſhips he had taken, except the admiral; which was to be conducted to Venice, and laid up as a trophy. Capello came off with a ſevere reprimand; but the Venetians were obliged to buy, with 500,000 ducats, a peace from the Porte. The Grand Seignior offered to repair the loſs of the Algerines by building ten galleys for them, upon condition that they ſhould continue in his ſervice till the end of the enſuing ſummer; but Pinchinin, who knew how little the Algerines choſe to lie under obligations to him, civilly declined the offer. Mean time, the news of this defeat filled Algiers with the utmoſt confuſion. The whole city was on the point of a general inſurrection, when the baſhaw and douwan iſſued a proclamation, not only forbidding all complaints under the ſevereſt penalties, but all perſons whomſoever, to *take their thumbs from within their girdles*, while they were deliberating on this important point. In the mean time, they applied to the Porte for an order, that the Venetians, ſettled in the Levant, ſhould make up their loſs. But with this the Grand Seignior refuſed to comply, and left them to repair their loſſes, as well as build new ſhips, the beſt way they could. It was not long, however, before they had the ſatisfaction to ſee one of their corſairs land with a freſh ſupply of 600 ſlaves, whom he had brought from the coaſt of Iceland, whither he had been directed by a miſcreant native taken on board a Daniſh ſhip. Our pirates did not long continue in their weak and defenceleſs ſtate; being able, at the end of two years, to appear at ſea with a fleet of 95 ſail, which ſoon cleared the ſeas, and brought home vaſt numbers of ſlaves, and an immenſe quantity of rich ſpoils; inſomuch that the Engliſh, French, and Dutch, were obliged to cringe to the mighty Algerines, who ſometimes vouchſafed to be at peace with them, but ſwore eternal war againſt Spain, Portugal and Italy, whom they looked upon as the greateſt enemies to the Mahometan name. At laſt Lewis XIV. provoked by the outrages committed by the Algerines on the coaſts of Provence and Languedoc, ordered, in 1681, a conſiderable fleet to be fitted out againſt them, under the Marquis du Queſne, vice-admiral of France. His firſt expedition was againſt a number of Tripolitan corſairs; who took ſhelter in the iſland of Scio, but purſuing them thither, he quickly deſtroyed 14 of their veſſels, beſides battering the walls of the caſtle; and finding they ſtill continued their outrages on the French coaſt, he ſailed to Algiers in Auguſt 1682, cannonading and bombarding it ſo furiouſly, that the whole town was in flames in a very little time. The great moſque was battered down, and moſt of the houſes laid in ruins, inſomuch that the inhabitants were on the point of abandoning the place; when on a ſudden the wind changed, and obliged du Queſne to return to Toulon. The Algerines immediately made repriſals, by ſending a number of galleys to the coaſt of Provence, where they committed the moſt dreadful ravages, and brought away a vaſt number of captives: upon which a new armament was ordered to be got ready at Toulon and Marſeilles againſt the next year; and the Algerines having received timely notice, put themſelves in as good a ſtate of defence as the time would allow. In May 1683, du Queſne with his ſquadron caſt anchor before Algiers; where being joined by the Marquis D' Affranville, at the head of five ſtout veſſels it was reſolved to bombard the town. Accordingly 100 bombs were thrown into it the firſt day, which did terrible execution; while the beſieged made ſome hundred diſcharges of their cannon againſt them, without doing any conſiderable damage. The following nights the bombs were again thrown into the city in ſuch numbers, that the dey's palace and other great edifices were almoſt deſtroyed; ſome of their batteries were diſmounted, and ſeveral veſſels ſunk in the port. The dey and Turkiſh baſhaw, as well as the whole ſoldiery, alarmed at this dreadful havock, immediately ſued for peace. As a preliminary, the immediate ſurrender was inſiſted on of all Chriſtian captives who had been taken fighting under the French flag; which being granted, 142 of them were immediately delivered up, with a promiſe of ſending him the remainder as ſoon as they could be got from the different parts of the country. Accordingly du Queſne ſent his commiſſary general and one of his engineers into the town; but with expreſs orders to inſiſt upon the delivery of all the French captives without exception, together with the effects they had taken from the French; and that Mezomorto their then admiral, and Hali Rais one of their captains, ſhould be given as hoſtages. This laſt demand having embarraſſed the dey, he aſſembled the douwan, and acquainted them with it: upon which Mezomorto fell into a violent paſſion, and told the aſſembly, that the cowardice of thoſe who ſat at the helm had occaſioned the ruin of Algiers; but that, for his part, he would never conſent to deliver up any thing that had been taken from the French. He immediately acquainted the ſoldiery with what had paſſed; which ſo exaſperated them, that they murdered the dey that very night, and on the morrow choſe Mezomorto in his place. This was no ſooner done, than he cancelled all the articles of peace which had been made, and hoſtilities were renewed with greater fury than ever. The French admiral now kept pouring in ſuch volleys of bombs, that, in leſs than three days, the greateſt part of the city was reduced to aſhes. Mezomorto, unmoved at all theſe diſaſters, and the vaſt number of the ſlain, whoſe blood ran in rivulets along the ſtreets; or rather, grown furious and deſperate, ſought only how to wreak his revenge on the enemy; and, not content with cauſing all the French in the city to be cruelly murdered, ordered their conſul to be tied hand and foot, and faſtened alive to the mouth of a mortar, from whence he was ſhot away againſt the navy.—By this piece of inhumanity du Queſne was ſo exaſperated, that he did not leave Algiers till he had utterly deſtroyed all their fortifications, ſhipping, almoſt all the lower part, and above two thirds of the upper part of the city; by which means it became little elſe than a heap of ruins. The haughty Algerines were now thoroughly convinced that they were not invincible; and therefore, immediately ſent an embaſſy into France, begging in the moſt abject terms for peace; which Lewis immediately granted, to their inexpreſſible joy. They now began to pay ſome regard to other nations, and to be a little cautious how they wantonly incurred their diſpleaſure. The firſt bombardment by the French had ſo far humbled the Algerines, that they condeſcended to enter into a treaty with England; which was renewed upon terms very advantageous to the latter, in 1686. It is not to be ſuppoſed, however, that the habitual perfidy of the Algerines would diſappear on a ſudden: notwithſtanding this treaty, they loſt no opportunity of making prizes of the Engliſh ſhips when they could conveniently come at them. Upon ſome infringement of this kind, captain Beach drove aſhore and burnt ſeven of their frigates in 1695; which produced a renewal of the treaty five years after: but it was not till the taking of Gibraltar and Port Mahon, that Britain could have a ſufficient check upon them to enforce the obſervation of treaties; and theſe have ſince proved ſuch reſtraints upon Algiers, that they ſtill continue to pay a greater deference to the Engliſh than to any other European power. The laſt century furniſhes no very remarkable events in the hiſtory of Algiers; except the taking of the famous city of Oran from the Spaniards in 1708, which they retook in 1737, and the expulſion of the Turkiſh baſhaw, and uniting his office to that of dey in 1710. This introduced the form of government which ſtill continues in Algiers.

ALGIERS, THE CONTEST BETWEEN, AND THE UNITED STATES. When the United States of America had obtained their independence, it was naturally to be expected, that they alſo ſhould ſuffer from the ravages of the corſairs. Various circumſtances pointed them out, as eligible objects of piratical rapine. They poſſeſſed an extenſive trade with Europe, which, in the firſt place, preſented a ſplendid temptation to plunder. There was on the part of the Algerines a ſecond and irreſiſtible motive to hoſtilities. America did not ſupport, at her national expence, any maritime force whatever; and thirdly, had ſhe even eſtabliſhed an armed navy, this country lies at the diſtance of more than 3000 miles from the common range of the privateers of Barbary. Hence, to reduce them to ſubmiſſion muſt have required a proportion of trouble and expence greatly ſuperior to the ſubſtantial magnitude of the object of attack; and this remoteneſs of our ſituation might be conſidered as an additional inducement to the regency of Algiers for interrupting our navigation. Of the number and ſtrength of the corſairs, it is impoſſible to give an accurate ſtatement. Their actual force, however, compared with that which the United States could eaſily fit out, is but trifling. To bring their whole ſhips of war, at once, to a regular engagement never can be practicable; but ſhould it happen, it may, without preſumption be ſuppoſed that 12 or 15 American frigates would ſend their navy to the bottom. When we reflect on the numerous and peculiar incitements, which theſe pirates had to commence depredations on the commerce of the United States, inſtead of being ſurpriſed at our having ſuffered ſo much, it rather becomes an object of wonder that we ſuffered ſo little. The fact, however, was this, that from the independence of North America, the Algerines had, for a ſeries of years, been conſtantly at war with the Dutch or the Portugueſe, or both at once; and as either of theſe nations is greatly ſuperior to the corſairs in regular ſtrength at ſea, they, for the ſecurity of their own commerce, watched the entrance of the Mediterranean ſo carefully, that the corſairs were ſeldom able to get out of it. That they ſometimes did ſo was unfortunately too true from the circumſtance of the ſchooner Maria, captain Stephens, of Boſton, being taken ſo early as the 25th of July 1785, off cape St. Vincent; and the ſhip Dolphin, captain O'Brien, of Philadelphia, being captured five days after, about 50 leagues to the weſtward of Liſbon; but, in general, they were ſhut up in the Mediterranean as in a priſon, without a poſſibility of extending their depredations on the Atlantic ocean. Into the former, American veſſels but ſeldom ventured; and even in that ſea, the progreſs of the Algerines was conſiderably cramped by the Portugueſe and Dutch ſhips of war, and both theſe nations, as well as the Spaniards, from a regard to their own intereſt, as well as from the common principles of juſtice and humanity, were forward to extend their protection to the American flag. About the year 1793, however, this protection was ſuſpended, becauſe a ceſſation of hoſtilities had taken place between Holland and Portugal on the one ſide, and the regency of Algiers on the other, whilſt Spain was, at the ſame time, engaged in the general combination of Europe againſt the republic of France. The corſairs of Barbary were thus at liberty to attack the veſſels of the United States, not only in the Mediterranean, but alſo in the Atlantic ocean, and in the courſe of a very few months no leſs than eleven of our veſſels were taken, and upwards of 100 more of our citizens condemned to ſervitude.—From the final eſtabliſhment of American Independence ſome attempts were ſaid to have been made by the government to conclude a pacification with the ſtate of Algiers. The buſineſs, however, was attended with great difficulty and it was not finally accompliſhed till 1797. As a knowledge of the ſteps which were taken by our government to bring about this deſirable event may be agreeable to our readers, we ſhall endeavor to lay before them as brief a ſtatement as poſſible. When col. Humphreys left America in April 1795, he was accompanied by Joſeph Donaldſon, Eſq. who had been appointed conſul for Tunis and Tripoli, and him col. Humphreys was authoriſed to employ in negociating a treaty with Algiers, while he himſelf ſhould proceed to France for the purpoſe of obtaining the co-operation of that government. They arrived at Gibraltar the 17th of May. Col. Humphreys concluding that it was expedient for Mr. Donaldſon to go firſt to Alicant, rather than Algiers, in order to be near at hand to aſcertain facts, and profit by occaſions, gave him inſtructions accordingly, and ſet off to Paris, whither he arrived in the end of June. On the 28th of July aſſurances were received from the French government, that immediate meaſures would be taken for giving particular inſtructions to the agents of the Republic to uſe their influence in co-operation with us. The multiplicity of affairs however, with which the officers of that government were occupied, and the getting from London a ſum of money neceſſary to purchaſe the uſual peace preſents, prevented the concluſion of this arrangement at Paris until September. It had been judged expedient by col. Humphreys, that Joel Barlow Eſq. ſhould be employed in the negociation with the Barbary ſtates and his conſent had been obtained. By the 11th of September, all the writings on the part of Col. Humphreys were prepared for Mr. Barlow to proceed with the inſtruction and powers from the government of the French republic, to its agents in Barbary, in favour of the negociation.

Col. Humphreys left Paris the 12th of September, and reached Havre the 14th, where he found the maſter and mate of the United States brig Sophia, both ſick with fevers. While waiting there impatiently for their recovery, he received intelligence from our conſul at Marſeilles, that Mr. Donaldſon had concluded a treaty of peace with the Dey of Algiers; nevertheleſs col. Humphreys thought it expedient, that Mr. Barlow ſhould proceed with the preſents prepared and preparing at Paris, for if not needed at Algiers, they would be wanted in the negociation with Tunis and Tripoli.—About the 5th of October col. Humphreys ſailed from Havre, and after a ſtormy paſſage of more than 40 days, arrived at Liſbon the 17th November. There he found capt. O'Brien, who had arrived about the 1ſt of October, with the treaty with Algiers. This treaty had been concluded on the 5th September, and the peace preſents immediately given by a loan, whilſt Mr. Donaldſon, knowing that funds had been lodged in London, to anſwer his ſtipulations, engaged to make the payment in 3 or 4 months. Col. Humphreys finding matters in this ſituation, and counting the money as always ready after this period, gave orders to capt. O'Brien to proceed to London in the brig Sophia, to receive it; but owing to contrary winds, ſhe did not leave Liſbon till the 24th of December. Various diſappointments, however, occurred in the pecuniary negociations, which put the treaty in jeopardy, and it was with extreme difficulty the Dey was prevented from abandoning it. Mr. Barlow did not arrive at Alicant until February 1796, where he propoſed to wait the arrival of the funds; but, after a little time, his intelligence from Algiers, ſhowing that our affairs were in a critical ſituation, he determined to go thither immediately, with the hope of ſoothing the Dey. He arrived there on the 4th of March, and on the 3d of April, the Dey declared as his final determination, that in 8 days, Meſſrs. Barlow and Donaldſon ſhould leave Algiers, and if in 30 days after, the money was not paid, the treaty ſhould be at an end, and his cruiſers bring in American veſſels. Under theſe circumſtances, and as the laſt hope of ſaving the treaty, they were induced to offer the preſent of a frigate; and this fortunately ſucceeded. Col. Humphreys not deeming himſelf authorized to confirm this promiſe, referred the matter to the executive of the United States, and for this end diſpatched capt. O'Brien, in the brig Sophia, to America. There was evidently no alternative; the promiſe was confirmed, and a new frigat of 32 guns, which was then building at Portſmouth, was, as ſoon as finiſhed, ſent off to the Dey. Capt. O'Brien returned to Liſbon in July, and Col. Humphreys having advantageouſly negociated bills on London for 220,000 dollars, that ſum, beſides preſents for the Dey, was embarked on board the Sophia, and on the 3d of Auguſt, captain O'Brien ſet out for Algiers. We ſhall give the ſequel of this buſineſs in the words of capt. O'Brien's letter, dated Philadelphia, April 5th, 1797.

"I was captured (ſays he) on the 18th of Auguſt, adjacent to Algiers, by a corſair of Tripoli, and my brig, money and crew carried into Tripoli, and with the crew of the ſhip Betſey, of Boſton, made ſlaves of. But ſhewing the dey of Algier's paſſport, and making it appear that I was ſtill his ſlave; that the money delivered to me by the United States was the ſame as if delivered to the dey, I was after two days examination liberated, and arrived in Algiers the firſt of October, delivered the money, and by the well timed, and well adapted plans of Mr. Barlow, I ſailed the 10th October, commiſſioned on the buſineſs of the peace of the United States, with the regencies of Tunis and Tripoli. I arrived at Tunis the 16th of October. The dey of Algiers wrote to the bey of Tunis, to make peace on the terms, which he preſcribed; but Tunis inſiſted on three times the ſum. After many fruitleſs attempts to prevail on the bey of Tunis to lower the price of peace with the United States, and finding that the bey would not accede to the terms, which the dey of Algiers preſcribed, I wrote to Mr. Barlow, who communicated the Tunisian demand to the Dey; but he would not allow Mr. Barlow to acquieſce. Leaving the Tunis buſineſs in this ſituation, I proceeded to Tripoli, and with much difficulty made the peace there the 4th of November, & ſailed from thence the 27th of November, bringing away the remaining part of the crew of the ſhip Betſey. I arrived at Tunis the 7th of December, where I received Mr. Barlow's and the Dey's orders, to demand a definitive anſwer from the Bey of Tunis, whether he would make peace with the United States on the terms which the Dey of Algiers preſcribed. The Bey of Tunis would not. Having diſcretionary powers, I tried what could be done; but the Bey's demands were not within my limits. I ſailed from Tunis and arrived at Algiers on the 3d of January (1797) and explained all requiſite affairs to the potent Dey and to Mr. Barlow. The Dey was much enraged at the non-compliance of the Bey of Tunis, and, on account of ſome old grudge as well as the rejection of his interceſſion in our affairs, the Dey ordered his Eaſtern camp of 60000 men, to enter the Tuniſian territory. His troops plundered, cut off heads and ears, and returned to the Algerine territory. This was to feel the political pulſe of the government of Tunis, to know if it would ſtill continue to be dependent on the Dey of Algiers. The Dey declared, that the buſineſs of Tunis, relative to its making peace with the United States was under his guarantee, and in conſequence, gave orders to proceed for the Weſtern world."

How theſe infamous pirates have kept the peace, which coſt the United States ſo much expence and trouble, is but too well known. The bey of Tripoli, notwithſtanding the faithful performance of our engagements, has already commenced hoſtilities againſt us, becauſe our government did not think proper to keep pace with his increaſing and inſatiable demands; (ſee Tripoli) and in the year 1800, the ſhip George Waſhington being then at Algiers, with tribute to the dey, was, notwithſtanding the ſpirited remonſtrance of her commander, captain Bainbridge, and captain O'Brien, the American conſul, obliged to carry the annual preſents from the Algerine government to the Grand Seignior. That the commander of a ſhip of war belonging to a friendly nation, ſhould be compelled to undertake ſuch an employment, without orders from his own government, is truly humiliating: but here there was no choice; for if he had not acquieſced, his whole crew as well as himſelf, would have been condemned to ſlavery, and the corſairs would have been ſet looſe on our defenceleſs commerce. The United States, however, are not the only people over whom theſe marauders domineer with impunity: for, it is no leſs incomprehenſible than true, that they have reduced the greateſt powers of Europe to the diſgrace of making them annual preſents, which, under whatever name they are diſguiſed, are in fact a tribute. For further particulars, ſee Barbary, Tripoli, Tunis.

Algiers, Income, Election, &c. of the Dey of. The Dey is now abſolute monarch, and pays no other revenue to the Porte, than that of a certain number of fine boys and ſome preſents, which are ſent thither yearly. His own income riſes or falls according to the opportunity he has of fleecing both natives and foreigners; whence it is variouſly computed by different authors. Dr. Shaw computes the taxes of the whole kingdom to bring into the treaſury no more than $300,000; but ſuppoſes that the eighth part of the prizes, the effects of thoſe perſons who die without children, joined to the yearly contributions raiſed by the government, preſents from foreigners, fines and oppreſſions, may bring in about as much more. Both the dey, and officers under him, enrich themſelves by rapine and fraud; which it is no wonder to find the common people practiſing upon one another, and eſpecially upon ſtrangers, ſeeing they themſelves are impoveriſhed by heavy taxes, and the injuſtice of thoſe who are in authority. We have already hinted, that the firſt deys were elected by the militia, who were then called the *douwan*, or common council. This elective body was at firſt compoſed of 800 militia officers, without whoſe conſent the dey could do nothing; and upon ſome urgent occaſions, all the officers reſiding in Algiers, amounting to above 1500, were ſummoned to aſſiſt. But ſince the deys have become more powerful, the douwan is principally compoſed of 30 chiah-baſhaws, or colonels, with now and then the mufti and cadi upon ſome emergencies; and, on the election of a dey, the whole ſoldiery are allowed to give their votes. All the regulations of ſtate ought to be determined by that aſſembly, before the dey hath power to put them in execution: but, for many years back, the douwan is of ſo little account, that it is only convened out of formality, and to give aſſent to what the dey and his chief favourites have concerted beforehand. The method of gathering the votes in this *auguſt* aſſembly is perfectly agreeable to the character of thoſe who compoſe it. The aga, or general of the janizaries, or the preſident *pro tempore*, firſt propoſes the queſtion; which is immediately repeated with a loud voice by the chiah-baſhaws, and from them echoed by four inferior officers from theſe the queſtion is repeated from one member of the douwan to another, with ſtrange contortions, and the moſt hideous growlings, if it is not to their liking. From the lowdneſs of this growling noiſe, the aga is left to gueſs as well as he can whether the majority of the aſſembly are pleaſed or diſpleaſed with the queſtion; and from ſuch a prepoſterous method, it is not ſurpriſing that theſe aſſemblies ſhould ſeldom end without ſome tumult or diſorder. As the whole body of the militia is concerned in the election of a new dey, it is ſeldom carried on without bloodſhed: but when once the choice is made, the perſon elected is ſaluted with the words *Alla Barrick*, "God bleſs you, and proſper you;" and the new dey uſually cauſes all the officers of the douwan to be ſtrangled, filling up their places with thoſe who had been moſt zealous in promoting it. From this account of the election of the deys, it cannot be expected that their government ſhould be at all ſecure; and as they arrive at the throne by tumult, diſorder and bloodſhed, they are generally deprived of it by the ſame means, ſcarcely one in ten of them having the good fortune to die a natural death.

Algiers, other officers of. The officer next in power to the dey is the aga of the janizaries, who is one of the oldeſt officers in the army, and holds his poſt only for two months. He is then ſucceeded by the chiah, or next ſenior officer.—During the two months in which the aga enjoys his dignity, the keys of the metropolis are in his hands; all military orders are iſſued out in his name; and the ſentence of the dey upon any offending officer, whether capital or not, can only be executed in the court of his palace.—Next to the aga in dignity, is the ſecretary of ſtate, who regiſters all the public acts; and after him are the 30 chiahs, or colonels, who ſit next to the aga in the douwan, and in the ſame gallery with him. Out of this claſs are generally choſen thoſe who go ambaſſadors to foreign courts, or who diſperſe the dey's orders throughout the realm.—Next to them are 800 bolluck-baſhaws, or eldeſt captains, who are promoted to that of chiah-baſhaws, according to their ſeniority. The oldack-baſhaws, or lieutenants, are next; who amount to 400, and are regularly raiſed to the rank of captains in their turn, and to other employments in the ſtate, according to their abilities. Theſe, by way of diſtinction, wear a leather ſtrap, hanging down to the middle of their back. One rule is ſtrictly obſerved in the rotation of theſe troops from one deputy to a higher; viz. the right of ſeniority; one ſingle infringement of which would cauſe an inſurrection, and probably coſt the dey his life. Other military officers of note are the purveyors of the army; the peys, who are the four oldeſt ſoldiers, and conſequently the neareſt to preferment; the foulacks, who are the next in ſeniority to them, and are part of the dey's body-guard, always marching before him when he takes the field, and diſtinguiſhed by their carbines and gilt ſcymiters, with a braſs gun on their caps; the kayts, or Turkiſh ſoldiers, each band of whom have the government of one or more adowars, or itinerant villages, and collect their taxes for the dey; and the ſagiards, or Turkiſh lance-men, 100 of whom always attend the army, and watch over the water appointed for it. To theſe we may add the begs, or governors of the three great provinces. All the above-mentioned officers ought to compoſe the great douwan or council above-mentioned; but only the 30 chiah-baſhaws have a right to ſit in the gallery next after the dey: The reſt are obliged to ſtand on the floor of the hall, or council-chamber, with their arms acroſs, and, as much as poſſible, without motion; neither are they permitted to enter with their ſwords on, for fear of a tumult. From the above account, it is evident, that the government of Algiers, though by ſome abſurdly ſtyled a republic, if it is not a perfect deſpotiſm, can at beſt be only ranked as a vile oligarchy; as the ſoldiers, who do not exceed 7000, keep the government in their own hands, while the natives have no ſhare.

Algiers, trade of. The corſairs, or pirates, form a ſmall republic, of which the rais or captain is the ſupreme baſhaw; who, with the officers under him, form a kind of douwan, in which every matter relating to the veſſel is decided in an arbitrary way. Theſe corſairs are chiefly inſtrumental in importing whatever commodities are brought into the kingdom either by way of merchandize or prizes; which conſiſt chiefly of gold and ſilver ſtuffs, damaſks, cloths, ſpices, tin, iron, plated braſs, lead, quick-ſilver, cordage, ſail-cloth, bullets, cochineal, linen, tartar, alum, rice, ſugar, ſoap. cotton, raw and ſpun, copperas, aloes, brazil and logwood, vermilion, &c. Very few commodities, however, are exported from this part of the world: the oil, wax, hides, pulſe, and corn produced, being but barely ſufficient to ſupply the country. The conſumption of oil, though here in great abundance, is likewiſe ſo conſiderable in this kingdom, that it is ſeldom permitted to be ſhipped off for Europe. The other exports conſiſt chiefly in oſtrich feathers, copper, ruggs, ſilk ſaſhes, embroidered handkerchiefs, dates, and Chriſtian ſlaves. Some manufactures in ſilk, cotton. wool, leather, &c. are carried on in this country, but moſtly by the Spaniards ſettled here, eſpecially about the metropolis. Carpets are alſo a manufacture of the country, which, though inferior to thoſe of Turkey, both in beauty and fineneſs, are preferred by the people to lie upon, on account of their being both cheaper and ſofter. There are alſo, at Algiers, looms for velvet, taffaties, and other wrought ſilks; and a coarſe ſort of linen is likewiſe made in moſt parts of the kingdom. The country furniſhes no materials for ſhip-building. They have neither ropes, tar, ſails, anchors, nor even iron. When they can procure enough of new wood to form the main timbers of a ſhip, they ſupply the reſt from the materials of prizes which they have made; and thus produce new and ſwift ſailing veſſels from the ruins of the old. Of all the ſtates on the coaſt of Barbary, Algiers is the ſtrongeſt at ſea.

Algiers, the capital of the kingdom, is ſituated 380 miles W. of Tunis, and oppoſite to Minorca. It is built on the declivity of a hill by the ſea ſide, in the form of an amphitheatre; and the houſes, riſing gradually above each other, make a fine appearance from the ſea. At a diſtance, the city looks like the top-ſail of a ſhip. The tops of the houſes are quite flat and white; ſo that, at a certain diſtance one would almoſt take it for a bleachfield. The roofs are uſed for walking, and many of them are covered with earth, and planted for gardens. The ſtreets, however, are ſo narrow, that they will ſcarce admit two perſons to walk abreaſt, and the middle part is lower than the ſides. When any loaded beaſts, ſuch as camels, horſes, mules, or aſſes paſs along, one is forced to ſtand up cloſe to the wall to let them paſs. There is but one broad ſtreet, which runs through the city from E. to W. in which are the ſhops of the principal merchants and the market for corn and other commodities. The lower part of the walls are of hewn ſtone, and the upper part of brick; they are 30 feet high on the land ſide, and 40 towards the ſea; the foſſes and ditches are 20 feet broad, and 7 deep. There is no ſweet water in the city; and there is a ciſtern in every houſe, yet the inhabitants often want water, as it rains but ſeldom: the chief ſupply is from a ſpring on a hill, the water of which is conveyed by pipes to above 100 fountains. The common reſervoir is at the end of the mole, where the ſhips take in their water. Every one takes his turn at theſe places, except the Turks, who are always firſt, and the Jews laſt. There are 5 gates which are open from ſun-riſing till ſun-ſetting, and 7 forts, or caſtles without the walls, the greateſt of which is on the mole without the gate, and all of them are well ſupplied with great guns. The moſques are ſo numerous, that they are ſaid to amount to about 107, many of which are handſome ſtructures, and are chiefly ſituated near the ſea ſide. The houſes are ſquare, and built of ſtone and brick, with a ſquare court in the middle, and galleries all round. There are ſaid to be about 100,000 Mahometans in the city, and 15,000 Jews, beſides 2000 Chriſtian ſlaves. There are four fundics, or public inns, ſuch as are in Turkey; and ſix cazernes, or barracks, for the unmarried Turkiſh ſoldiers, which will hold 600 each. There are no inns for Chriſtians to lodge at; but only a few tippling huts kept by ſlaves, for the accommodation of Greeks and the poorer ſort of travellers, where any thing may be had for money. Here are bagnios, or public baths, ſimilar to thoſe in Turkey, at a very moderate rate. The women have baths of their own, where the men dare not enter. Without the city there are a great number of ſepulchres, and chapels, dedicated to marabouts, or reputed ſaints, which the women go to viſit every Friday.

The ſurrounding country is extremely delightful, being agreeably diverſified with hills and plains. It enjoys a continual verdure, and produces in abundance, corn, fruit, pulſe and flowers. The vines here are of a ſurpriſing beauty, and yield proportionably: ſome climb to the tops of very lofty trees, and extending themſelves to others form natural bowers, which in that climate muſt be very agreeable. Algiers, though for ſeveral ages, it has braved ſome of the greateſt powers in Chriſtendom, could make but a faint defence againſt a regular ſiege ; and ſome writers have even aſſerted, that three Engliſh 50 gun ſhips might batter it about the ears of its inhabitants from the harbour. If ſo, the Spaniards muſt have been very deficient either in courage or conduct. They attacked it in the year 1775, by land and by ſea, but were repulſed with great loſs ; tho' they had near 20,000 foot, 2000 horſe, twenty-ſeven royal ſhips of different rates, and 346 tranſports. In 1783, and 1784, they alſo renewed their attacks by ſea to deſtroy the city and galleys ; but, after ſpending a quantity of ammunition, bombs, &c. were forced to retire without effecting either its capture or deſtruction. The mole of the harbor is 500 paces in length, extending from the continent to a ſmall iſland where there is a large battery. Lon. 77. 18. E. Lat. 36. 49. N.

ALGONQUINS, a nation in North America, who formerly poſſeſſed great tracts of land along the N. ſhore of the river St. Laurence. For a long time they had no rivals as hunters and warriors, and were in alliance with the Iroquois ; whom they agreed to protect from all invaders, and to give them a ſhare of their veniſon. The Iroquois, on the other hand, paid a tribute to their allies, out of the culture of the earth ; and performed for them all the menial ſervices of flaying the game, curing the fleſh, and dreſſing the ſkins. By degrees, however, the Iroquois aſſociated in the hunting matches and warlike expeditions of the Algonquins ; ſo that they ſoon began to fancy themſelves as well qualified, either for war or hunting, as their neighbors.—One winter, a large detachment of both nations having gone out a hunting, and ſecured, as they thought, a vaſt quantity of game, ſix young Algonquins and as many Iroquois were ſent out to begin the ſlaughter. The Algonquins, probably become a little jealous of their aſſociates, upon ſeeing a few elks, deſired the Iroquois to return, on pretence that they would have ſufficient employment in flaying the game they ſhould kill ; but after three days' hunting, having killed none, the Iroquois exulted, and in a day or two privately ſet out to hunt for themſelves. The Algonquins were ſo exaſperated at ſeeing their rivals return laden with game, that they murdered all the hunters in the night. The Iroquois diſſembled their reſentment ; but in order to be revenged, applied themſelves to ſtudy the art of war as practiſed among ,thoſe ſavage nations. Being afraid of engaging with the Algonquins at firſt, they tried their proweſs on other inferior nations, and, when they thought themſelves ſufficiently expert, attacked the Algonquins with ſuch diabolical fury, as ſhowed they could be ſatisfied with nothing leſs than the extermination of the whole race ; which, had it not been for the interpoſition of the French, they would have accompliſhed—The few Algonquin nations that are now to be ſeen, ſeem entirely ignorant of agriculture, and ſubſiſt by fiſhing and hunting.

Their language is one of the three radical ones in North America, and is ſpoken with ſome diverſity of dialect by moſt of the natives from the river St. Laurence to the Miſſiſſippi.

ALGOR, *n. s.* Extreme cold ; chilneſs.

ALGORISM, } *n. s.* Arabick words, which are uſed
ALGORITHM, } to imply the ſix operations of Arithmetic, or the ſcience of numbers.

ALGUAZIL, in the Spaniſh polity, an officer whoſe buſineſs it is to ſee the decrees of a judge executed.

ALI, a ſect among the Mahometans, who adhere to the right of ſucceſſion of Ali, and to the reform of Muſſulmaniſm introduced by him. This ſect is more particularly called *Schiites ;* and ſtand oppoſed to the *Sunnites*, or ſect of Omar, who adhere to the law as left by Mahomet, Abubeker, and Omar. After Mahomet's death, great diſputes aroſe about the ſucceſſion, and many ſtood for Ali, but Abubeker was preferred, and elected the firſt kalif. The Perſians are the chief adherents to the ſect of Ali, whom they hold to have been the legitimate ſucceſſor of Mahomet, and Abubeker an uſurper. On the contrary, the Turks are of the ſect of Omar, and hold Ali in execration. The diſtinguiſhing badge of the followers of Ali is a red turban, which is worn by the Perſians, who are hence called in deriſion, by the Turks, *Kisilbachi*, q. d. *red beads.* Ali is ſaid to have been the author of ſeveral works, particularly one intituled *Centiloquium*, which is much eſteemed among the Arabs and Perſians ; and part of which has been tranſlated into Engliſh by M. Ockley. He alſo wrote an interpretation of the Alcoran, different from that of Omar.

ALIAS, *adv.* a Latin word, ſignifying *otherwiſe ;* often uſed in the trials of criminals, whoſe danger has obliged them to change their names ; as, Simſon, *alias* Smith, *alias* Baker ; that is, *otherwiſe* Smith, *otherwiſe* Baker.

Alias, in law, a ſecond or farther writ iſſued after a *capias*, &c. ſued out without effect.

ALIBI, in law, denotes the abſence of the accuſed from the place where he is charged with having committed a crime ; or his being *elſewhere*, as the word imports, at the time ſpecified.

ALICANT, a ſea port of Spain, in Valencia, and territory of Segura ; remarkable for its excellent wine, and the fertility of its ſoil, which produces excellent fruits and plenty of roſemary of an excellent ſize. It has a great trade, and the Engliſh, French, Dutch and Italians have Conſuls here. The caſtle, which is ſituated on a high rock was deemed impregnable ; but it was taken by the Engliſh, in 1705 and held out a ſiege of two years before it was retaken by the French and Spaniards ; but at laſt ſurrendered upon honorable terms, after part of the rock was blown up, on which the caſtle ſtood. The port is defended by 3 baſtions furniſhed with cannon, and to prevent the viſits of the Algerine pirates, watch-towers were built to give notice of the approach of an enemy's ſhip. It is ſeated on the Mediterranean, on a bay of the ſame name, 37 miles N. E. of Murcia, and 75 S of Valencia, Lon. 74. 24. E. Lat. 38. 24. N.

ALIEN, *adj.* 1. Foreign, or not of the ſame family or land.—Eſtranged from ; not allied to ; adverſe to ; with the particle *from*, and ſometimes *to*, but improperly.

Alien, *n. s.* 1. A foreigner ; not a deniſon ; a man of another country or family ; one not allied ; a ſtranger.—2. In law,—An *alien* is one born in a ſtrange country, and never enfranchiſed. The children of perſons duly naturalized, dwelling within the United States and being under the age of twenty-one years, at the time of ſuch naturalization ; and the children of citizens of the United States, born out of the limits and juriſdiction of the United States, ſhall be conſidered as citizens—Provided that the right of citizenſhip ſhall not deſcend to perſons, whoſe fathers have never been reſident in the United States. *Laws U. S. 2d Seſs. 1st. Con. chap.* LXXXV.

An **Alien**, in G. Britain is incapable of inheriting lands in that country till naturalized by an act of parliament.—No alien is intituled to vote at the election of members of parliament; nor can he enjoy any office, or be returned on any jury, unleſs where an alien is party in a cauſe, when the inqueſt is compoſed of an equal number of deniſons and aliens. The reaſons for eſtabliſhing theſe laws were, that every man is preſumed to bear faith and love to that prince and country where he received protection during his infancy; and that one prince might not ſettle ſpies in another's country; but chiefly that the rents and revenues of the country might not be drawn to the ſubjects of another.—

Alien Acts, *in* **Great-Britain** *and* **America,** *ſubſtance of the late.*—Soon after the commencement of the late war between Great-Britain and France, the former deeming it neceſſary to make the laws againſt aliens ſtill more ſtrict, paſſed an act relative to that ſubject, which was commonly called *The Alien Bill.* In the year 1798, when there was reaſon to apprehend an open rupture between the United States and the French Republic, a bill concerning aliens was brought into Congreſs, which, notwithſtanding a powerful oppoſition, was on the 27th June paſſed into a law. How obnoxious this act was to the great maſs of the American people muſt be remembered by every one. Its duration was, however, limited to two years, at which period no attempt was made for its renewal. As the American act has ceaſed to exiſt, and, in all probability, the Britiſh will be repealed at the end of the war, which gave occaſion for it, it will not be expected, that we ſhould enter into a long detail of their reſpective contents. It ſhall, therefore, ſuffice to mention a few of thoſe clauſes, which, in both countries were deemed the moſt arbitrary and oppreſſive, and which, in the American bill, ſo nearly correſponded with thoſe of the Britiſh, that the former was no more than a ſervile imitation of the latter. By both theſe acts, maſters of veſſels were under a ſevere penalty, obliged to give in to the officers of the cuſtoms, at the port of arrival, a written report, ſpecifying the names, age, place of nativity, &c. of the foreigners on board. 2. By both acts, aliens were under certain penalties, obliged to give in to officers appointed to receive the ſame, a written declaration of their names, ſex, occupation, place of allegiance, &c. within 48 hours after their arrival, and of ſuch declarations, they were to receive a certificate from the officer. 3. By the Britiſh act, authority was given to the King, and by the American, to the Preſident of the United States, to order all ſuch aliens to depart out of the reſpective territories, as they ſhould think dangerous to the general peace and ſafety. In both countries, perſons not complying with ſuch order might be impriſoned and afterwards ſent out of the country by warrant of the executive. 4. If any alien ſo ſent out of G. Britain ſhould be afterwards found in the kingdom, he was to be tranſported for life, and in caſe of his returning, he was to ſuffer death. In America, however, where ſanguinary puniſhments are, thanks to Heaven, but little known, the penalty, was only impriſonment, ſo long as, in the opinion of the Preſident, the public ſafety might require. This abſtract may be ſufficient to ſhow, the general principles of the alien bill, which was generally conſidered in the United States as an act highly repugnant to that liberal policy, which ought to have diſtinguiſhed the government of a country ſo thinly inhabited, and which had heretofore extended her open arms to the oppreſſed of all nations. The friends of this law cannot deny that, during its exiſtence, the happineſs of aliens was held on a very precarious and uncertain tenure, viz. the will of an individual; but in juſtice to the late executive, it ought not to be omitted, that we know not even of a ſolitary inſtance in which the law was put in practice.

ALIENABLE, *adj.* that of which the property may be transferred.

ALIENATE, *adj.* withdrawn from; ſtranger to: with the particle *from.*

To **Alienate,** *v. a.* 1. To transfer the property of any thing to another.—2. To withdraw the heart or affections.

ALIENATION, *n. s.* 1. The act of transferring property.—2. Change of affection.

Alien Duty, an impoſt laid on all goods imported by aliens, over and above the cuſtoms paid for ſuch goods imported by American citizens, and on American bottoms. See **Duty.**

To ALIGHT, *v. a.* to come down, and ſtop.

ALIKE, *adv.* with reſemblance; in the ſame manner; in the ſame form.

ALIMENT, *n. s.* nouriſhment; that which nouriſhes; nutriment; food: from which, by the proceſs of digeſtion, is prepared a very mild, ſweet, and whitiſh liquor, reſembling milk, and diſtinguiſhed by the name of *chyle;* which being abſorbed by the lacteal veins, by them conveyed into the circulation, and there aſſimilated into the nature of blood, affords that ſupply of nutrition which the continual waſte of the body is found to require. See **Digestion.**

Aliment, directions for choosing. Next to air, food is the moſt neceſſary thing for the preſervation of our bodies: and as on the choice thereof our health greatly depends, it is of great importance to underſtand in general, what is the propereſt for our nouriſhment; and, in particular deviations from health, what is the beſt adapted to reſtore us. Our blood and juices naturally incline to become putrid and acrimonious: freſh chyle, duly received, prevents this deſtructive tendency, and preſerves in them that mild ſtate which alone conſiſts with health. An animal diet affords the moſt of this bland nutritious mucilage; watery fluids dilute the too groſs parts, and carry off what is become unfit for uſe. It is only the ſmall portion of jelly which is ſeparated from the farinaceous parts of vegetables, that, after being much elaborated, is converted into the animal nature; yet the uſe of vegetables prevents both repletion and a too great tendency to a putreſcent acrimony of the blood. In hot climates, as well as from the conſtitutional heat of particular perſons, vegetables are required in the largeſt proportion. Animal ſubſtances afford the higheſt reliſh while our appetite continues; but ſate the appetite before the ſtomach is duly filled. Vegetables may therefore be eaten after either fleſh or fiſh: few herbs or fruits ſatiate ſo much as that the ſtomach may not be filled with them, when it is already ſatisfied with fleſh or fiſh; for no diet, which is very nouriſhing, can be eaten to fulneſs, becauſe its nutritious parts are oily and ſatiating.—Health depends almoſt wholly on a proper craſis of the blood; and, to preſerve this, a mixture of vegetables in ſome degree is always required; for a loathing is ſoon the conſequence of animal food alone: hot acrid habits, too, receive from milk and vegetables what is needful for correcting their exceſſes: but in cold, pituitous, and nervous habits, which require much nouriſhment from little digeſtion, and from the ſmalleſt quantity of food, animal diet is to be uſed more freely. Theſe being obſerved as general principles with reſpect to the matter and quality of our aliment, the valetudinarian may eaſily regulate his diet with ſome advantage to himſelf by an attention to the few following particulars. In winter, eat freely, but drink ſparingly: roaſt meat is to be preferred, and what is drank ſhould be ſtronger than at other ſeaſons. In ſummer, let thirſt determine the quantity to be drunk, only taking care not to drink any thing cold, when too warm. Cold ſtomachs never require much drink: boiled meats and vegetables, if not otherwiſe contradicted, may now be more freely uſed. Lax habits require the winter's diet to be continued all the year, and rigid ones ſhould be confined to that of ſummer. Fat people ſhould faſt at times, but the lean ſhould never faſt long. Thoſe who are troubled with eructations occaſioned by their food ſhould drink but little, and uſe ſome unaccuſtomed exerciſe. The thirſty may drink freely, but ſhould eat ſparingly. In general, let moderation be obſerved; and though no dinner hath been had, a light ſupper is at all times to be preferred. After very high-ſeaſoned meats, a glaſs of water acidulated with the acid elixir of vitriol, or in very weak ſtomachs the ſweet elixir of vitriol, is reckoned by medical people more aſſiſtant to digeſtion than brandy. See Food and Drink.

ALIMENTAL, *adj.* that which has the quality of aliment: that which nouriſhes.

ALIMENTARY, *adj.* 1. That which belongs or relates to aliment.—2. That which has the quality of aliment, or the power of nouriſhing.

Alimentary Duct, or Canal, *ductus alimentalis*, is that part of the body through which the food paſſes, from its reception into the mouth, to its exit at the *anus;* including the *gula*, ſtomach, and inteſtines. See Anatomy. This duct is ſaid to be the true characteriſtic of an animal, there being no animal without it, and whatever has it, being properly ranged under the claſs of animals. Plants receive their nouriſhment by the numerous fibres of their roots, but have no common receptacle for digeſting the food received, or for carrying off the recrements. But in all, even the loweſt degree of animal life, we may obſerve a ſtomach and inteſtines, even where we cannot perceive the leaſt formation of any organs of the ſenſes, except the common one of feeling, as in oyſters.

ALIMENTATION, *n. s.* 1. The power of affording aliment; the quality of nouriſhing. 2. The ſtate of being nouriſhed by aſſimilation of matter received.

ALIMONY, *n. s.*—*Alimony* ſignifies that legal proportion of the huſband's eſtate, which, a married woman ſues for, and is entitled to for her maintenance, upon the account of any ſeparation from him, provided it be not cauſed by her elopement or adultry.

ALIQUANT, *adj.* *Aliquant* part, in arithmetic is that number which cannot meaſure any other exactly without ſome remainder, as 3 is an aliquant part of 10, for thrice 3 wants one of 10, and four times 3 exceeds 10 by 2.

ALIQUOT, *adj.* Aliquot parts of any number or quantity, ſuch as will exactly meaſure it without any remainder: as, 3 is an aliquot part of 12, becauſe being taken four times, it will juſt meaſure it.

ALISH, *adj.* reſembling ale; having qualities of ale.

ALISMA, or White Plantain: A genus of the polygynia order, belonging to the hyxandria claſs of plants; and in the natural method ranked under the 5th order, Tetrapetaloideæ. The characters are: The calyx is a three leaved perianthium: The corolla conſiſts of three roundiſh, large, flat, expanding petals: The ſtamina conſiſts of ſix ſubulated filaments ſhorter than the corolla; the antheræ are roundiſh: the piſtillum conſiſts of more than five germina; the ſtyli are ſimple, the ſtigmata obtuſe: the ſeeds are ſmall and ſolitary. Of this genus there are eight ſpecies, viz. the *flava*, or yellow water plantain; the *parnasſifolia;* the *cordifolia*, and the *ſubulate*, all of which are natives of America, and are generally found in ſtagnating waters, and other ſwampy places. The others are the *plantago*, or great water plantain; the *ranuncloides;* the *natans*, and the *damasonium*, all of which are natives of Britain.

ALITURE, *n. s.* nouriſhment.

ALIVE, *adj.* 1 In the ſtate of life; not dead 2. Unextinguiſhed; undeſtroyed; active. 3. Cheerful; ſprightly. 4. In a popular ſenſe, it is uſed only to add an emphaſis, as, the *best* man *alive;* that is, the *best*, with an emphaſis.

ALKA, the auk. See Alca.

ALKAHEST, *n. s.* A word uſed firſt by Paracelſus, and adopted by his followers; to ſignify an univerſal diſſolvent, or liquor, which has the power of reſolving all things into their firſt principles. Van Helmont pretended he was poſſeſſed of ſuch a menſtruum; but however credulous people might be impoſed on in his days, the notion is now become as ridiculous as the philoſopher's ſtone, the perpetuum mobile, &c. It is likewiſe uſed by ſome writers, for all fixed ſalts volatilized, and reduced into a quinteſſence.

ALKALESCENT, *adj.* that which has a tendency to the properties of an alkali.

ALKALI, *n. s.* any ſubſtance, which, when mingled with acid, produces efferveſcence and fermentation.

Alkali, in botany. See Kali and Salicornia.

Alkali, in chemiſtry, one of the general diviſions of ſalts, comprehending that claſs of chemical elements which, by their union with acids, form *perfect neutrals*, ſo called in diſtinction from the ſalts formed of acids with metals or earths, which are ſtiled *imperfect*. See the five following articles, and the ſections under Alkaline Salts.

Alkalies, common properties of. Alkaline ſalts are of two kinds, the fixed and the volatile; and of the former there are two ſpecies, the vegetable and mineral. All of theſe poſſeſs ſome properties in common, and ſome peculiar to each other. Thoſe which they have in common are, 1. An acid and pungent taſte, which, when the ſalts are very pure and ſtrong, is abſolutely cauſtic, and would entirely deſtroy the organ of ſenſation if long applied to it. 2. A tendency to diſſolve animal ſubſtances, and reduce them to a gelatinous ſubſtance, which all of them will do when very ſtrong. 3. An attraction for acids, with a power of ſeparating earths and metals from them. 4. A power of changing the blue vegetable juices to green; the green to yellow; the yellow to orange; the orange to red; and the red to purple. 5. A propenſity to unite with oils, and to deſtroy almoſt all colours that can be put upon cloth, whence their uſe in bleaching, &c. Efferveſcence with acids was formerly ſuppoſed to be a diſtinguiſhed property of alkalies, though it was always known that by a mixture with quick-lime they might be deprived of this property. Dr. Black, however, ſhows, that the efferveſcing with acids is no property of pure alkali, but is occaſioned only by the eſcape of fixed air from it: and that when quicklime is added, which extracts the whole or greateſt part of the fixed air, no efferveſcence can be perceived. In the ſtate in which the fixed alkalis are commonly met with, indeed, efferveſcence with acids may be ſaid to be an eſſential property; but this is entirely owing to the fixed air, to which they are united during the proceſs by which they were originally formed. The quantity of this air, however, is never ſo great as to ſaturate them entirely; on the contrary, their alkaline properties are always very perceptible, and they are commonly ſaid to be in a *mild* ſtate. But the truth is, that they are in a kind of intermediate ſtate between what may be called perfectly mild and perfectly cauſtic. In their perfectly mild ſtate, they are united with ſuch a large quantity of fixed air as entirely overpowers their alkaline properties; and therefore they are more entitled to the name of alkalies in that ſtate, than when combined with the marine, nitrous, or any other acid; in which caſe the compounds are called neutral ſalts. But it is a much more laborious and tedious proceſs to ſaturate an alkali completely with fixed air than with any other acid; nor does it very eaſily retain the aerial acid after it has once been combined with it. Hence the cauſtic taſte and properties of the alkali almoſt always predominate, and the ſalt contains a portion of pure and cauſtic alkali, to which alone its virtues are to be aſcribed. See Alkaline Salts.

Alkalis fixed. The properties commom to both vegetable and mineral fixed alkalies are, 1. They reſiſt the action of fire to a great degree, ſo that they can eaſily be reduced to a ſolid form by evaporating any liquid in which they happen to be diſſolved. 2. By an intenſe fire they flow into a liquid which concretes into a hard and ſolid maſs in the cold. 3. When mixed in certain proportions with thoſe earths or ſtones called *vitrifiable*, they melt, in a heat ſtill more intenſe, into glaſs. 4. Mixed with ammoniacal ſalts, with animal ſubſtances, or with ſoot, they extricate a volatile alkali. Both kinds of fixed alkalies may be deprived of their fixed air, and thus rendered pure and cauſtic, by the addition of quicklime. In this ſtate the difference between them is much leſs perceptible than in any other, though the addition of fixed air, or any other acid, always ſhows that no eſſential change has taken place in either. In this highly cauſtic ſtate they deſtroy the parts of animals in a manner ſimilar to that of fire; whence they are called *potential* cauteries, as the former is called the *actual* cautery. M. Morveau ſays, that on digeſting a piece of beef in a ſolution of cauſtic vegetable alkali, the liquor ſoon became red, and the fleſh appeared like a ſemitranſparent jelly, in which, however, one could eaſily perceive the ratifications of the ſmalleſt fibre; and, after ſtanding ſome months, it emitted very little ſmell. The vegetable alkali is commonly uſed as the material for the common cauſtic, or *lapis infernalis* of the ſhops. See Chemistry Index. Both alkalis attract moiſture from the air when reduced to a ſolid form in their cauſtic ſtate, though neither the foſſil alkali nor its combinations do ſo in any other caſe. In their cauſtic ſtate too, they only unite with oils, or diſſolve in ſpirit of wine; which laſt they have been ſuppoſed to purify, though it is more than probable that they decompoſe and communicate diſagreeable qualities to it.

Alkali Fossil or Mineral. The mineral alkali differs from the vegetable (which ſee) in having a ſmaller attraction for acids, in being more eaſily fuſible by itſelf, and forming a more ſoluble compound with the vitriolic acid. It is alſo eaſily cryſtallizable, even without the addition of more fixed air than it naturally contains: and experience has determined it to be more proper for glaſs or ſoap manufactures than the vegetable alkali; for which reaſon the demand for it is very conſiderable. The mineral alkali was anciently called *natron* or *nitre*, and is found native in many parts of the world, which is never the caſe with the vegetable alkali. The great ſource of this alkali, however, is the water of the ocean. Mineral alkali is the natural baſis of ſea ſalt; and could any method of readily procuring it from this ſalt be fallen upon, it would be a valuable diſcovery. All the methods hitherto uſed with any ſucceſs by the chemiſts may be reduced to two. 1. By mixing the nitrous acid with ſea ſalt in a retort, in the proportion of four of the acid to one of the ſalt, and diſtilling off the muriatic acid, or rather aqua regia, which will be produced in the proceſs. The reſiduum will afford a cubical nitre by cryſtallization, from whence the alkali may be obtained pure by deflagrating with charcoal. 2. By adding vitriolic acid, the ſpirit of ſea ſalt will be expelled much more eaſy, than by the nitrous acid. The reſiduum affords Glauber's ſalt in great plenty: this being melted in a crucible with a ſufficient quantity of charcoal duſt, forms a hepar ſulphuris; which being decompoſed by the vegetable acid, the later may be deſtroyed by force of fire, and the alkali obtained in purity. See Chemisty.

Alkali Vegetable. Vegetable alkali is obtained in its greateſt purity by deflagrating nitre with charcoal, provided we make no more uſe of the latter than is barely ſufficient to deſtroy the nitrous acid. It is, however, a very difficult matter to adjuſt this proportion with ſufficient accuracy; for if we employ too much charcoal, the ſalt will be conſiderably phlogiſticated; if too little, ſome part of the nitre will remain undecompoſed. Burnt Tartar therefore, purified by ſolution and filtration, may be looked upon as the beſt vegetable alkali. The common alkalis, ſaid to be obtained from the aſhes of vegetables, are always mixed with much phlogiſton, and ſometimes with lime, ſalt, or other heterogeneous matters; for which reaſon, they are not to be employed in the nicer chemical experiments, without being purified by ſolution in water, by filtration, and cryſtallization. The vegetable alkali when thus purified, and containing near one half its weight of fixed air, is white when dry, with a very hot and cauſtic taſte, poſſeſſing, in an eminent degree, all thoſe qualities which have been aſcribed to the alkaline ſalts in general. It runs *per deliquium* when expoſed to the air and is uſually incapable of being cryſtalized, though it acquires this property after being employed in the rectification of ardent ſpirits. It adheres more cloſely to acids than any ſubſtance hitherto diſcovered. After this alkali has been united with marine acid, the ſalt produced reſembles Glauber's ſalt almoſt as much as it does vitriolated tartar. It ſeems therefore to have made ſome approach towards the nature of foſſil alkali; but chemiſts have not inveſtigated what would be the conſequence of ſuch repeated combinations. See Alkaline Salts.

Alkali, Volatile. The volatile alkali differs from the fixed alkalis in being unable to reſiſt the fire, and being entirely reſolvable into an inviſible and permanently elaſtic fluid, called by Dr. Prieſtley, *alkaline air*. In conſequence of this volatility, it affects the olfactory nerves very perceptibly, and its ſmell is the general criterion by which its ſtrength may be eſtimated. Its attraction for acids, power of changing colours, &c. are alſo conſiderably weaker than thoſe of the fixed alkalis. Though two ſorts of volatile alkali are commonly ſold under the names of ſpirits of hartſhorn and ſal-ammoniac, they differ only in their degree of purity. The former is ſo called from its being originally made from the horns of deer; but this material has long been laid aſide, and the bones of horſes, the *ſlints*, as they are called, of the horns of cattle, the parings of hoofs, &c. have been ſubſtituted in their ſtead. This kind, however, carefully prepared, always contains a portion of animal oil, the ſmell of which is very perceptible: the other, prepared from pure ſal ammoniac, is totally free from an empyreumatic ſmell, and it is as pure as it can be obtained by any means whatever. The volatile alkali, when procured immediately by diſtillation of any ſubſtance capable of yielding it, is obtained in a ſtate ſimilar to that in which the alkalis are commonly met with, viz. half mild and half cauſtic. By expoſing the liquid alkali to a great quantity of fixed air, we at laſt have it mild and perfectly neutraliſed; in which ſtate it appears as a white ſalt extremely volatile, though leſs ſo than the pure cauſtic alkali. It diſſolves very readily in water; but unleſs ſome cauſtic ſpirit, or ſome lime or fixed alkali be added, in order to abſtract part of the fixed air, it will ſcarcely exhibit the characteriſtic of volatile alkali, viz. a pungent and urinous ſmell. The addition of fixed air, however, makes very little difference with regard to the chemical combinations of this ſalt; for as fixed air has a very ſlender power of acidity, it is expelled by every other acid with the greateſt eaſe, and the ſame combinations formed as though it had not been preſent. The only difference is, that when a mild alkali is added to an acid, a ſtrong efferveſcence takes place by reaſon of the eſcape of the fixed air through the liquid, while with the cauſtic alkali the mixture is made quietly and without diſturbance. See Alkaline Salt.

ALKALINE, *adj.* that which has the qualities of alkali. Any watery liquor will keep an animal from ſtarving very long, by diluting the fluids, and conſequently keeping them from an *alkaline* ſtate.

Alkaline Salts, combinations of, with acids. The various combinations of the Alkaline ſalts with the different acids, and the neutral compounds thence reſulting, are exhibited in the following tables:—

I. Fossil or mineral fixed alkali combined with

Acetous acid	forms	A ſalt reſembling terra foliata tartari, but which does not deliquate.
Acid of Borax		Borax.
Acid of phoſphorus		An unknown ſalt.
Acid of tartar		Rochelle ſalt.
Aerial acid		Mild foſſil alkali.
Marine acid		Common ſalt.
Nitrous acid		Cubical nitre.
Saccharine acid, &c.		Unknown ſalts.
Vitriolic acid		Glauber's ſalt.

II. Vegetable fixed alkali combined with

Acetous acid	forms	Terra foliata tartari.
Acid of borax, Acid of phoſphorus		Anomalous ſalts whoſe properties have not been aſcertained.
Acid of tartar		Soluble tartar.
Aerial acid		Mild or aerated alkali.
Marine acid		Sal digeſtivus.
Nitrous acid		Nitre.
Saccharine acid, &c.		Anomalous ſalts
Vitriolic acid		Vitriolated tartar.

III. Volatile alkali combined with

Acetous acid	forms	Spiritus mindereri.
Acid of borax		An anomalous ſalt.
Acid of phoſphorus		Micocroſmic ſalt, or eſſential ſalt of urine.
Acid of tartar		A ſalt not yet inveſtigated, which ſhoots into fine long cryſtals, and does not deliquate in the air.
Aerial acid		Volatile ſal ammoniac or ſalts of hartſhorn.
Marine acid		Common ſal ammoniac.
Nitrous acid		Nitrous ammoniac, or volatile nitre.
Saccharine acid, &c.		Anomalous ſalts.
Vitriolic acid		Vitriolic ammoniac, or Glauber's ſecret ſal ammoniac.

Alkaline salts, combinations of, with oils, &c. The alkalis, beſides their attraction for acids, have alſo an attraction for oils, ſulphur, and ſpirit of wine in the moiſt way, when the ſalts are deprived of their fixed air; and in this, as well as in the dry way, with ſeveral metals, and vitrifiable earths and ſtones.—With oil the vegetable fixed alkali forms a ſoap, though leſs perfect than that made with the cauſtic mineral alkali. When combined with fixed air, they ſcarcely unite with oils. Boiled with ſulphur, or melted with it in their dry ſtate, they unite into a very fœtid compound called *hepar ſulphuris*, which is ſoluble in water, but totally and very quickly decompoſed by the contact of air. Vegetable alkali unites with iron, tin, and zinc; corrodes copper, and runs with it into a liquor of a deep blue colour, and joins with lead in fuſion. It does not act upon gold in its metallic ſtate, but if a ſufficient quantity be added to a ſolution of gold in aqua regia, the calx of the metal will be firſt precipitated and afterwards diſſolved.—Vegetable alkali is a principal ingredient in the powders called *fluxes*, uſed for the fuſion of metalline ores. It promotes the fuſion of earths, and forms glaſs with the cryſtalline kind. It is ſoluble in the ſame weight of diſtilled water; and, when expoſed to the air, it ſoon attracts moiſture from it, and flows into a liquid. In its cauſtic ſtate it diſſolves in ſpirit of wine, and forms with it a red tincture called *Van Helmont's tincture of salt of tartar*, formerly uſed both as an internal and external remedy, but now in diſrepute.—Foſſil alkali in its cauſtic ſtate unites with oil into a harder ſoap than that made with vegetable alkali. With ſulphur it forms a hepar ſulphuris in the ſame manner as the vegetable alkali, and yields a tincture with ſpirit of wine, which diſſolves part of the ſalt whilſt hot, but lets it fall again in a cryſtalline form when cold.—Gold, ſilver, or quick-ſilver, are not affected by a ſolution of this ſalt; but copper and tin are diſſolved by it in the open air. It affects lead, regulus of antimony, and cobalt, ſlightly; but acts powerfully upon zinc, and forms a kermes mineral with crude antimony. Copper, iron, biſmuth, zinc, antimony, and regulus of cobalt, fuſed with two parts of foſſil alkali, are almoſt entirely diſſolved in a very ſtrong heat; but tin, lead, and regulus of antimony, only ſuffer a partial ſolution in it.

Alkaline Salts, medical powers of. All the alkalis are of conſiderable uſe in medicine, though the particular virtues of vegetables and foſſil alkali have not hitherto been duly aſcertained. It is probable, however, that there muſt be a conſiderable diverſity in their operations on the human body, as the vegetable alkali ſhews itſelf much more acid and powerful than the foſſil. As they both unite immediately with acids, and change them into mild neutral ſalts, if any of the ſtrong mineral acids ſhould fall upon any part of the human body, and begin to corrode and give pain, the immediate application of the lixivium tartari, or of a ſolution of any of thoſe alkaline ſalts in water, or of the ſalts themſelves in powder, will deſtroy their cauſticity, and prevent their doing further miſchief: Or if any of theſe acids ſhould drop on clothes, linen, or other ſubſtances, and alkaline ſalts are immediately applied, they will neutralize the acid, and prevent its further corroſion: Or if a perſon ſhould, through miſtake, ſwallow any of the mineral acids, or corroſive ſublimate, or any other corroding ſalt, which an alkali can decompoſe, the ſwallowing ſolutions of the alkaline ſalts, or the ſalts themſelves in proper doſes, are the moſt likely means of affording relief, if not given too late. Oil of vitriol, however, in its concentrated ſtate, muſt be excepted; for if it ſhould happen to be ſwallowed, it contracts ſuch a degree of heat on the contact of any aqueous fluid as would deſtroy the patient, independent of any other cauſe. A perſon once miſtook a bottle of it for water in the night. He recovered by ſwallowing inſtantly a great quantity of milk. Another recovered by drinking a bottle of Florence oil. Both the vegetable and foſſil alkali applied externally in a cauſtic ſtate, firſt irritate and inflame the ſkin, and afterwards act as fire in mortifying and deſtroying it; and therefore have been much uſed by ſurgeons for opening buboes and other abceſſes, and for eating away the proud fleſh that ſprouts out from ſores. Various formulæ of cauſtic alkalis have been employed for theſe purpoſes. See Chemistry and Pharmacy. Alkaline ſalts preſerve animal ſubſtances from putrefaction; on which account ſome practitioners have conoluded that they act as ſtrong antiſeptic remedies when ſwallowed as medicines, taken up by the lacteal veſſels, and mixed with the blood. Experience, however, has ſhown, that they have effects directly oppoſite, and that by ſtimulating the veſſels and quickening the circulation. they contribute towards the diſſolution of the vital fluid; of which Dr. Munro ſays he has ſeen ſeveral inſtances. Alkalies promote the ſecretions in general, particularly by the kidneys; but by the help of warm liquors and bed-cloths, their operations may be directed towards the ſkin. They have alſo been employed in caſes of heartburn, &c. where an acid prevails in the ſtomach and bowels, or where theſe organs are loaded with viſcid phlegm. They are likewiſe preſcribed to aſſiſt the operation of the bile when it is too weak, either by themſelves, or mixed with purgative medicines. The foſſil alkali has been alledged to be a more powerful ſolvent of the human calculus than the vegetable, though perhaps without any juſt foundation. See next article.

Alkaline Salts, medical prescriptions of. In caſes of the ſtone or gravel, the mineral alkali is given from 5 to 20 grains three times a-day; and in ſome caſes even to double that quantity. It may be taken in any common liquor, or in clear broth made of lean meat, from which the fat has been ſkimmed off; or the powdered ſalts may be made up into pills or boluſes mixed with liquorice powder, by means of mucilage of gum Arabic or conſerve.—The vegetable alkali has long been uſed as a diuretic in dropſies with great ſucceſs; and Dr. Monro informs us, that he has ſeen a number of caſes of anaſarcha in which the water was carried off by it. As a diuretic, it may be taken from ten grains to half a drachm, or more, two or three times a-day, mixed with ſome diſtilled water, ſyrup, broth, or water gruel, or with two ounces of white wine, which partly neutralizes the ſalt. When added to infuſions of juniper berries, broom tops, horſe radiſh, muſtard ſeed, winter's bark, &c. in wine and beer, they prove powerful diuretics; and Dr. Monro gives the following formula.—"Take broom tops, horſe radiſh, and juniper berries, of each an ounce; bruiſe them in a ſtone or marble mortar; put them into a large wide-mouthed bottle, and add to them an ounce of ſalt of tartar and two quarts of Rheniſh wine. Infuſe them for four days; decant off the wine, and filter it through paper for uſe. Two or three ounces may be taken three or four times a-day."—Or, "Take an ounce of canella alba, and as much muſtard ſeed and juniper berries: bruiſe them well in an iron mortar, and add an ounce of purified vegetable alkali with two quarts of porter: infuſe for 4 days and filter the liquor through paper; let the patient take a wine glaſs full every 5 or 6 hours."—The diuretic powers of theſe medicines are ſometimes increaſed by opium, and they have been ſucceſsfully joined with eſſential oils and balſams.—The moſt remarkable property of theſe ſalts, however, is that of diſſolving the human calculus; for the diſcovery of which, Mrs. Stephens, in the year 1740, obtained a parliamentary reward of 5000l. ſterling ($22,200). At that time Dr. Jurins being afflicted with the ſtone, tried a number of experiments on theſe medicines; from which he concluded that their efficacy depended entirely on the alkaline

line ſalts and lime which they contained; and therefore he began to try what effect a ſoap ley would have on himſelf. At firſt he took only a few drops, but gradually increaſed his doſe till he came to an ounce, and ſometimes an ounce and a half, in a proper vehicle, in 24 hours. This produced the diſcharge of ſome ſmall calculi, and relieved him of the ſymptoms of the ſtone. Dr. Hartley, likewiſe, laboured under this complaint; and believing that the efficacy of Mrs. Stephen's medicines depended on the ſoap, lime, and alkaline ſalts which they contained, ordered a paſte to be prepared for himſelf, made of 8 ounces of ſoap, one of oyſter ſhell lime, a drachm of ſalt of tartar, and as much water as formed the whole into a ſoft maſs; of which he took large quantities, and found himſelf greatly relieved, though not cured, as a ſtone was found in his bladder after his death. Theſe and other inſtances of ſucceſs, ſoon brought the medicines into general uſe: but though many found relief from them, others had all the ſymptoms of their diſtemper aggravated, by the ſalts rendering the blood, and other liquors of the body, particularly the urine, ſharp and acrid, ſo as to irritate and inflame the bladder, which was already in too irritable a ſtate, from the conſtant friction of the calculus lodged within it. The late experiments of Mr. Scheele, and Sir Torbern Bergman, however, have made it evident, that the human calculus is compoſed of a concreted acid joined to a ſmall portion of animal earth. Moſt people, therefore, who are afflicted with the ſtone or gravel, wiſh to try the efficacy of theſe remedies, rather than ſubmit to the dangerous operation of lithotomy; we therefore ſubjoin, from Dr. Monro, the following directions for making and uſing the ſoap ley. "Take of ſalt of tartar, 8 ounces; of freſh quick lime, 4 ounces; of diſtilled water, a quart: mix them all well together in a large bottle, and let them ſtand 24 hours; then pour off the ley and filter it through paper, keeping it in well ſtopped vials for uſe. Of this the doſe is from 30 drops to 3 or 4 drachms, to be repeated two or three times a-day. One of the beſt methods of taking this ley is, to mix the quantity to be uſed in the day with three pints of plain broth, which has been made with the lean part of veal, with all the fat or oily parts ſeparated from it, by putting it, when made, into a large bowl, and ſkimming them off with a ſpoon when cold, and to drink, within an hour, a pint of this broth, three times a-day—early in the morning—at noon—and in the evening; and to continue the uſe of this medicine, for 3, 4, or more months;" and. during this courſe, to live rather abſtemiouſly. With regard to the uſe of the ſoap ley, the doctor obſerves, "that he has ſeen a number of people who have taken it, both for gravelliſh complaints, and for the ſtone; that many of thoſe who had gravel, were relieved, and ſome of them ſeemed to be cured; that ſome few of thoſe who had the confirmed ſtone, received conſiderable relief for a time from its uſe: but the complaints afterwards returned; nor can he ſay that one complete cure was made; though from the accounts given by the late Dr. Whytt, of Edinburgh, and others, it ſhould appear that this had ſometimes happened: that in many caſes of the ſtone the ley occaſioned pain and irritation, and increaſed the violence of the ſymptoms ſo much, that the patients were obliged to lay it aſide; and that this happened moſt frequently where the bladder ſeemed to be already diſeaſed from the irritation of the ſtone: that at all times it is adviſable to lay aſide this medicine, at leaſt for a time, whenever it irritates and occaſions pain, or where there are appearances of its continued uſe having broken down the craſis of the blood." Inſtead of the ſoap ley, the following ſolution of vegetable alkali, ſaturated with fixed air, has been recommended as a powerful ſolvent of the ſtone. "Take two ounces of ſalt of tartar, and diſſolve it in two quarts of diſtilled water, and then ſaturate it fully with fixed air; and let the patient take 8 ounces of it every 8 hours." Dr. Monro, however, ſays he has ſeen only one gentleman who had found conſiderable relief from this preſcription. Soap ley has likewiſe been recommended as a ſolvent of bilious calculi, and has ſometimes been of ſervice; but this has probably ariſen more from its property of diſſolving thick and viſcid humours, and aſſiſting the action of the bile, than by acting on the calculi themſelves. The volatile alkali has many of the virtues of the fixed, but affects animal ſubſtances, particularly in its cauſtic ſtate, leſs powerfully. It gives a briſk ſtimulus to the nerves and fibres of living animals; and is therefore employed in diſeaſes where the circulation is too languid; in low fevers, where the patient is in danger of ſinking: in apoplectic and lethargic diſorders of elderly people of phlegmatic habits, in paralytic caſes, fainting fits, &c. where a ſtimulating remedy is wanted. It is often uſed as a diaphoretic and ſudorific in caſes of rheumatiſm, in the end of fevers, catarrhs, and other diſeaſes, where a plentiful diaphoreſis or ſweat is required; and, it is principally owing to this quality that the alkalis have obtained their reputation of being efficacious remedies againſt the bites of ſerpents and other venomous animals. It is as efficacious againſt mineral acid poiſons as the fixed alkali.

ALKALIZATE, *adj.* that which has the qualities of alkali; that which is impregnated with alkali.

To **Alkalizate**, *v. a.* to make bodies alkaline, by changing their nature, or by mixing alkalis with them.

ALKALIZATION, *n. s.* the act of alkalizating, or impregnating bodies with alkali.

To **ALKALIZE**, *v. a.* See *To* Alkalizate.

ALKMAAR or **Alcmaer**, an ancient and handſome town of the Batavian Republic, ſituated near Schermeer, one of the largeſt lakes in North Holland, and not more than a league from the ſea; with a canal from the Ye, and thence to Amſterdam. In the neighborhood of Alkmaar, the lands, which were formerly full of moraſſes, have been drained, and are now become very rich paſture and meadow land. It produces moſt excellent butter and cheeſe, and is noted for raiſing the fineſt tulips in the world, ſome of which have been ſold for ſums far exceeding credibility. The town of Alkmaar will long be remarkable in hiſtory, for the convention which was there agreed upon, between General Le Brune, commander in chief of the French and Batavian army and the Duke of York, commander in chief of the combined Engliſh and Ruſſian army, dated Alkmaer, Oct. 18th, 1799. Some part of the Engliſh army had been landed there about the middle of Aug. under the command of the late general Sir Ralph Abercrombie, but as he was in daily expectation of receiving reinforcements, it was his object to act only upon the defenſive. In ſuch attacks, however, as were made upon him, he was able to maintain his poſition. On the 9th September, the Duke of York arrived at the Helder and took upon himſelf the command of the army, which was now greatly augmented by a number of Britiſh as well as Ruſſian troops. The French and Batavian armies were likewiſe reinforced by great numbers. Various engagements enſued which were attended with immenſe ſlaughter; but the termination was ſuch, that the Duke of York entered into the convention above mentioned with general Brune, on the 18th Oct. The ſuſpenſion of hoſtilities and of all works, either for attack or defence, the ſucceſſive re-embarkation of the allied army, the re-eſtabliſhment of the works of the Helder, and the preſervation of the works conſtructed by the Engliſh and Ruſſian army, the unconditional reſtitution of 8000 French and Batavian priſoners, that of admiral Winter particularly ſtipulated, were the clauſes of this capitulation; and thus ended the hopes of the Britiſh government for the ſubjugation of Holland. See BATAVIAN REPUBLIC. Alkmaar is ſituated in Lon. 79. 44. E. Lat, 52. 40. N. and is 8 leagues N. N. W. from Amſterdam, 7 N. from Harlaem, and 8 N. N. W. from Rotterdam.

ALKORAN. See ALCORAN.

ALL, *adj.* 1. Being the whole number; every one.—2. The whole quantity; every part.

ALL, *adv.* 1. Quite; completely.—2. Altogether; wholly.—3. Only; without admiſſion of any thing elſe.—4. It is ſometime a word of emphaſis; nearly the ſame with *juſt.*

ALL-CONQUERING, *adj.* that which ſubdues every thing.

ALL-DEVOURING, *adj.* that which eats up every thing.

ALL-FOURS, *n. s.* a low game at cards.

ALL-GOOD, in botany. See CHENOPODIUM.

ALL-HAIL, *n. s.* all health: a term of ſalutation, expreſſed in Latin by the words *salve* or *salvete.*

ALL-HALLOW, } *n. s.* all ſaints day; the firſt of
ALL-HALLOWS, } November.

ALL-HALLOWTIDE, *n. s.* the term near all ſaints, or the firſt of November.

ALL-JUDGING, *adj.* that which has the ſovereign right of judgment.

ALL-KNOWING, *adj.* omniſcient; all-wiſe.

ALL-POWERFUL, *adj.* almighty; omnipotent.

ALL-SAINTS-DAY, a feſtival, called alſo ALL-HALLOWS, celebrated on the firſt of November, in commemoration of all ſaints in general, for whom no particular day had been appointed in the calendar. This feſtival is ſaid to have been inſtituted by Pope Boniface IV. in the year 835.

ALL-SAINTS-BAY, a large harbour of S. America, near St. Salvadore, in Brazil. It is the port of one of the richeſt and moſt fertile diſtricts in that country; which produces vaſt quantities of ſugar and cotton. There are ſeveral cities in the diſtrict, of which St. Salvadore is the capital. It is ſeated on the Atlantic ocean. Long. 35. 3. E. Lat. 12. 3. S.

ALL-SOULS-DAY, the day on which ſupplications are made for all ſouls by the church of Rome; the ſecond of November.

ALL-SPICE. See MYRTUS and CALYCANTHUS.

ALL-SUFFICIENT, *adj.* ſufficient to every thing.

ALL-WISE, *adj.* poſſeſt of infinite wiſdom.

ALLA, or ALLAH, the name by which the profeſſors of Mahometaniſm call the Supreme Being. It is ſynonimous with the Hebrew *Eloah*, which ſignifies the *Adorable Being.*

ALLAY, *n. s.* baſer metal mixed in coinage. See ALLOY.

To ALLAY, *v. a.* 1. To mix one metal with another in order to coinage.—2. To join any thing to another, ſo as to abate its predominant qualities.—3. To quiet; to pacify; to repreſs.

To ALLEDGE, to affirm, declare, or plead. See ALLEGE.

ALLEGANY, or APPALACHIAN, the moſt extenſive range of mountains in the United States. They commence at the Hudſon river, in the ſtate of New-York, and extend in a line nearly parallel to the Atlantic ocean, from the N. E. to the S. E. through New-Jerſey, Pennſylvania, Maryland, Virginia, and the two Carolinas, into the interior of the ſtate of Georgia, occupying a ſpace of about 1000 miles in length, and from 60 to 150 miles in breadth. The different ridges, which compoſe this immenſe range, have various names in the different ſtates, in which they are ſituated, ſuch as the Blue Mountains, the North Mountain or North Ridge, Laurel Ridge, and Kittatiny mountains, &c. In Georgia, they are ſometimes called the Cherokee mountains. They are not confuſedly ſcattered, but ſtretch along in uniform ridges, ſpreading towards the S. Some of them terminate in high perpendicular points; others gradually ſubſide into a level country, and give riſe to many rivers, which run ſoutherly into the gulph of Mexico. In ſeveral of theſe mountains, are found large quantities of lime-ſtone, coal, and iron ore. In the back parts of Pennſylvania, ſcarce one acre in ten of this vaſt range is capable of cultivation, but in other parts, extenſive tracts of fine arable and paſture land, intervene between the ridges, having a fine rich black ſoil; and ſome of the mountains admit of cultivation almoſt to their tops. Their height has never been meaſured; ſome ſuppoſe them to be half a mile high, but that is merely conjectural: the tops, however, of the higheſt are generally covered with a cloſe fog, and few days elapſe without rain, except in froſty weather.

ALLEGANY, a large and navigable river of Pennſylvania, which riſes on the weſtern ſide of the Allegany mountains, and after running about 200 miles in a S. W. direction, meets the Monongahela at Pittſburgh, and both united, form the Ohio, which ſee.

ALLEGANY, a large and uncultivated county of Pennſylvania, extending from the junction of the river of that name with the Ohio, where its chief town, Pittſburgh, is ſituated, to the New-York line. It is 144 miles in length, and 80 in breadth; and in 1790, contained 10,309 inhabitants. In this county is Oil Creek, which flows from a ſpring much celebrated for a bitumen reſembling Barbadoes tar, and known by the name of Seneca oil. It is ſaid to be a ſovereign remedy for various complaints and when taken internally, operates as a gentle cathartic.

ALLEGANY, a large, mountainous and hilly county of Maryland, and the moſt weſterly in that ſtate. It has Pennſylvania on the N. the Potowmac river ſeparates it from Virginia on the S. and it is bounded by Waſhington county on the E. It is 64 miles from E. to W. and 35 from N. to S. but in ſome places it is little more than five miles. In this county, is a warm ſpring, which, within theſe few years, has been greatly reſorted to by people labouring under various complaints, many of whom have found its waters very efficacious. It riſes between two large mountains; at the diſtance of 30 yards, is another ſpring, which aſtoniſhes every perſon by its coldneſs. Cumberland is the chief town of this county.

ALLEGATION, *n. s.* 1. Affirmation; declaration.—2. The thing alleged or affirmed.—3. An excuſe; a plea.

To ALLEGE, *v. a.* 1. To affirm; to declare; to maintain.—2. To plead as an excuſe, or produce as an argument.

ALLEGEABLE, *adj.* that which may be alleged.

ALLEGER, *n. s.* he who alleges.

ALLEGIANCE, *n. s.* the duty of ſubjects to the government, or it may be explained, that tie or *ligamen* which binds the ſubject or citizen to the ruling power, in return for that protection, which the ruling power affords the ſubject or citizen.

ALLEGIANCE has been diſtinguiſhed into two ſpecies, viz. local and natural. Local allegiance is ſuch as is due from an alien, during his reſidence in a foreign country, and ceaſes the inſtant ſuch ſtranger transfers himſelf from that country to another. Natural allegiance is that which is due from a man to the country which gave him birth; and, according to the Britiſh civilians, cannot be forfeited or altered by any change of time, place or circumſtances. According to their doctrine, a natural born ſubject of one prince, cannot by any act of his own, not even by ſwearing allegiance to another, put off or diſcharge his natural allegiance to the former; for they contend, that this natural allegiance was intrinſic, primitive and antecedent to the other and cannot be diveſted without the concurrent act of that prince to whom it was firſt due. *Natural* allegiance, they, therefore, hold in law, to be *perpetual;* whereas *local* is only *temporary.* It is foreign to our purpoſe to enter into a diſcuſſion, how far this doctrine may be juſt. It has, however, been advocated even from the bench by one of the moſt learned of our judges; although the different naturalization laws which have been paſſed in the United States, are obviouſly founded on a ſuppoſition of its abſurdity. An alien, previous to his being admitted as a citizen of the United States, takes an oath or affirmation, that he will ſupport the conſtitution of the United States, and that he doth abſolutely and entirely renounce and abjure all *allegiance* and fidelity to every foreign prince, potentate, ſtate or ſovereignty whatever, and particularly by name, the prince, potentate, ſtate or ſovereignty, whereof he was before a citizen or ſubject. See LAWS of the U. S. 2d Seſſ. 3d Cong. chap. lxxxv.

ALLEGORICAL, *adj.* in the form of an allegory; not real: not literal: myſtical.

ALLEGORICALLY, *adj.* after an allegorical manner.

ALLEGORIC, *adj.* after the manner of an allegory; not real: not literal.

To ALLEGORIZE, *v. a.* to turn into allegory; to form an allegory; to take in a ſenſe not literal.

ALLEGORY, *n. s.* a figurative diſcourſe, in which ſomething other is intended, than is contained in the words literally taken.

ALLEGORY, in compoſition, conſiſts in chooſing a ſecondary ſubject, having all its properties and circumſtances reſembling thoſe of the principal ſubject, and deſcribing the former in ſuch a manner as to repreſent the latter. The principal ſubject is thus kept out of view, and we are left to diſcover it by reflection. In other words, an allegory is, in every reſpect, ſimilar to an hieroglyphical painting, excepting only that words are uſed inſtead of colours. Their effects are entirely the ſame. An hieroglyphic raiſes two images in the mind; one ſeen, which repreſents one that is not ſeen. An allegory does the ſame; the repreſentative ſubject is deſcribed, and the reſemblance leads us to apply the deſcription to the ſubject repreſented. There cannot be a ſurer or more correct allegory than the following, in which a vineyard is made to repreſent God's own people, the Jews. "Thou haſt brought a vine out of Egypt; thou haſt caſt out the heathen and planted it. Thou didſt cauſe it to take deep root, and it filled the land. The hills were covered with its ſhadow, and the boughs thereof were like the goodly cedars. Why haſt thou then broken down her hedges, ſo that all that paſs do pluck her? The boar out of the wood doth waſte it, and the wild beaſt doth devour it. Return, we beſeech thee, O God of Hoſts; look down from Heaven and behold, and viſit this vine, and the vineyard thy right hand hath planted, and the branch thou madeſt ſtrong for thyſelf." Pſalm lxxx. Nothing gives greater pleaſure than an allegory, when the repreſentative ſubject bears a ſtrong analogy, in all its circumſtances, to that which is repreſented. But moſt writers are unlucky in their choice, the analogy being generally ſo faint and obſcure, as rather to puzzle than to pleaſe. No author, ancient or modern, has drawn a more complete or perfect allegory than John Bunyan, in his *Pilgrim's Progress;* a work which, we believe, has afforded pleaſure to many readers, even among thoſe who do not entirely approve of the doctrines it inculcates. An eminent London bookſeller, who had made an eſtimate of the quantity of copies ſold, of the books moſt univerſally read, ſays, that upwards of 430 000 copies of Bunyan's Pilgrim's Progreſs have been printed, which exceeds the ſale of all the other books in the Engliſh language, except the Bible and Prayer books, &c. This affords an indubitable proof how univerſally a well written allegory is reliſhed. See FABLE, METAPHOR, PARABLE, TYPE &c.

ALLEGRO, *n. s.* in muſic, an Italian word, denoting that the part is to be played or ſung in a ſprightly, briſk, lively, and gay manner.

ALLELUJAH. See HALLELUJAH.

ALLEMAND, a ſort of grave ſolemn muſic, invented by the Germans, with good meaſure, and a ſlow movement. It is a briſk kind of dance, very common in Germany and Switzerland.

ALLENS-TOWN, a town in Monmouth county, New-Jerſey, in which is a large public ſchool. It lies [illegible] miles N. E. of Philadelphia, eight miles E. by N. from Bordentown, and 15 miles S. by E. from Princeton.

ALLENS-TOWN, a townſhip of Rockingham county, New-Hampſhire, ſeated on the E. ſide of the river Merrimack, and about [illegible] miles N. W. from Portſmouth.

ALLEN-TOWN, a handſome little town in Northampton county, Pennſylvania, on the point of land which is formed by the junction of Jordan's Creek with the Little Lehigh. It contains about 100 houſes, a German Lutheran and Calviniſt church, an academy, and three merchant mills. It lies about 6 miles from Bethlehem, and [illegible] miles N. N. W. from Philadelphia. Lat 40. 30. N. Long. 0. 19. W.

To **ALLEVIATE**, *v. a.* to make light; to eaſe; to ſoften.

ALLEVIATION, *n. s.* 1. The act of making light, allaying, or extenuating.—2. That by which any pain is eaſed, or fault extenuated.

ALLEY, *n. s.* 1. A walk in a garden.—2. A paſſage in towns narrower than a ſtreet.

ALLIANCE, *n. s.* 1. The ſtate of connection with another by confederacy; a league. 2. Relation by marriage. 3. Relation by any form of kindred. 4. The perſons allied to each other.

Alliance, between ſtates, a treaty entered into by ſovereign princes or republics, for their mutual ſafety and defence.—In this ſenſe, alliances may be diſtinguiſhed into ſuch as are offenſive, whereby the contracting parties oblige themſelves jointly to attack ſome other power; and ſuch as are defenſive, whereby they bind themſelves to ſtand by and defend each other in caſe they are attacked by others.

Alliance, in a figurative ſenſe, is applied to any kind of union or connection; thus we ſay, there is an alliance between the church and ſtate.

ALLIGATION, *n. s.* 1. The act of tying together; the ſtate of being ſo tied. 2. The arithmetical rule that teaches to adjuſt the price of a compound, formed of ſeveral ingredients of different value. See **Aritmetic**.

ALLIGATOR, *n. s.* the crocodile. See **Crocodile**.

ALLIONIA, in botany, a genus of the monogynia order, belonging to the tetandria claſs of plants; and in the natural method ranked under the 48th order, Aggregatæ. The characters are: The common calyx is oblong, ſimple, three-flowered, five-parted, and perſiſtent; the proper one, obſcure, above: The proper corolla is monopetalous and funnel-ſhaped; the mouth quinquefied and erect: The ſtamina conſiſt of four briſtly filaments, longer than the corolla, and bending to one ſide; The antheræ are roundiſh: The piſtillum has an oblong germen beneath; the ſtylus is briſtly and longer than the ſtamina; the ſtigmata are multified and linear: There is no pericarpium: The ſeeds are ſolitary, oblong, and naked: The receptaculum is naked. There are two ſpecies, viz.

1. Allionia incarnata, }
2. Allionia violacea, } both natives of America.

ALLISION, *n. s.* The act of ſtriking one thing againſt another.

ALLIUM, a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking in the 9th order, Syathaceæ. The characters are: The calyx is a common ſpatha, roundiſh, and multiflorous: The corolla conſiſts of ſix oblong petals: The ſtamina are ſix ſubulated filaments, often the length of the corolla; the antheræ are oblong and erect: The piſtillum has a germen above, ſhorter, nearly three-cornered, with angles engraved with a line: the ſtyli are ſimple, the ſtigmata accute: The pericarpium is a very ſhort, broad, three-lobed capſule, with three cells and three valves: The ſeeds are many and roundiſh. Of this genus no fewer than 40 different ſpecies are enumerated by Linnæus, among which he includes the cepa and porrum, or onions and leeks.

Allium ascalonium, or eſchalot, was found wild in Paleſtine by Dr. Haſſelquiſt. The root is conglobate, conſiſting of many oblong roots bound together by thin membranes. Each of theſe ſmall roots ſends forth two or three fiſtulous, long, awl-ſhaped leaves, iſſuing from a ſheath, and are nearly like theſe of the common onion. The flower ſtem ſhoots from a membraneous ſheath; is round, almoſt naked, and terminated by a globular umbel, of flowers, which have erect, purpliſh, lance-ſhaped petals, of the length of the ſtamina.—The root of this ſpecies is very pungent, has a ſtrong, but not unpleaſant ſmell, and therefore is generally preferred to the onion for making high-flavoured ſoups and gravies. It is alſo put into pickles, and in the Eaſt Indies they uſe a great deal of it for this purpoſe.

Allium cepa, or common onion, differs from the garlic only in the ſwelling pipy ſtalk, which is much larger in the middle than at either end. From whence this was firſt brought into Europe, is not known; but that it is natural to Africa is beyond a doubt, it being evident that onions were eaten by the Egyptians above 2000 years before Chriſt. Dr. Haſſelquiſt ſays it is not to be wondered at that the Iſraelites ſhould long for them after they had left this place; for whoever has taſted onions in Egypt, muſt allow, that none can be had better in any part of the univerſe. The many ways of dreſſing onions amongſt us are known to every family: but in regard to wholeſomeneſs, there is certainly no method equal to boiling; as thus they are rendered mild, of eaſy digeſtion, and go off without leaving thoſe heats in the ſtomach and bowels, which they are apt to do any other way. Their nature is to attenuate thick, viſcid juices; conſequently a plentiful uſe of them in cold phlegmatic conſtitutions muſt prove beneficial. The varieties are, the Straſburgh, the Spaniſh, and the Egyptian onion. They are propagated by ſeeds, which ſhould be ſown early in ſpring, on good, light, rich ground, well dug and levelled, and cleared from weeds. They ſhould alſo be ſown at a time when the ſurface of the ground is not moiſt; and where they are intended for a winter crop, they muſt not be ſown too thick. The common allowance is ſix pounds of ſeed to an acre; though ſome allow more, in order to have a crop to draw out, which they call *cullings*. It may be eaſily known at what time the onions have arrived at their full growth by their blades falling to the ground and ſhrinking; and then, before their necks or blades are withered off, they ſhould be drawn out of the ground, the extreme part of the blade cut off, and the onions laid upon a dry ſpot of ground, obſerving to turn them every other day at leaſt, to prevent them from taking root again; which in moiſt weather they are apt to do. At any rate, they are very apt to grow in the lofts where they are kept all winter; the moſt effectual method of preventing which is, with a hot iron, ſlightly to touch their heads or roots, which will effectually prevent their ſprouting; but in doing this, great caution muſt be uſed not to ſcorch the pulp, for that will cauſe them to periſh ſoon after. To ſave ſeeds, ſome of the largeſt, firmeſt, and beſt ſhaped onions muſt be picked out in ſpring, and having prepared a piece of good ground, which ſhould be well dug, and laid out in beds about three feet wide, the onions muſt be planted in the following manner: Having ſtrained a line of about four inches within the ſide of the bed, you muſt with a ſpade throw out an opening ſix inches deep, the length of the bed, into which the onions ſhould be placed with their roots downward, at about nine inches diſtance from each other; and with a rake draw the earth into the opening

ing to cover the bulbs; then proceed to remove the line again about a foot farther back, where you muſt make an opening as before, and ſo again, till the whole is finiſhed, by which you will have four rows in each bed; between each bed you muſt allow the ſpace of two feet for an alley to go among them. In a month's time the leaves will appear above ground, and many of the roots will produce three or four ſtalks each. As ſoon as the flowers begin to appear, the ſtalks muſt be tied to ſtakes to prevent them from being broke by their own weight. You may know when the ſeed becomes ripe by the opening of the cells which contain it, and its changing to a brown colour. When the heads are cut off, they ſhould be ſpread abroad upon coarſe cloths in the ſun, obſerving to keep it under ſhelter in the night, as well as in wet weather. When the heads are quite dry, the ſeeds ſhould be beat out from them; and after being cleared from the huſks, and expoſed one day to the ſun to dry, they may be put up in bags for uſe.

Allium porrum, or leek, has been ſo long cultivated, that its native place of growth cannot be traced. It is undoubtedly the ſame as that mentioned in the 11th chap. of Numbers, where it is ſaid, the Iſraelites longed for leeks and onions. The leaves are much of the ſame nature as thoſe of the latter, and they are ſtill a conſtant diſh at the tables of the Egyptians, who chop them ſmall and eat them with their meat. They are in great eſteem, too, with the Welch, and their general uſe as a pot herb is well known. Their culture is the ſame with that of the onion.

Allium sativum, or garlic, has a bulbous root, of an irregularly roundiſh ſhape, with ſeveral fibres at the bottom; each root is compoſed of leſſer bulbs, called *cloves* of garlic, incloſed in one membranous coat, and eaſily ſeparable from one another. All the parts of this plant, but more eſpecially the roots, have an acrimonious, and almoſt cauſtic taſte, with a ſtrong offenſive ſmell, which laſt has induced thoſe who preſerved ſome of the ſpecies in gardens on account of their yellow flowers, to eradicate them. This pungent root warms and ſtimulates the ſolids, and attenuates tenacious juices; for which it is well adapted, on account of its being very penetrating; inſomuch that, when applied to the feet, its ſcent is ſoon diſcovered in the breath; and, when taken internally, its ſmell is communicated to the urine, or the matter of an iſſue, and perſpires through the pores of the ſkin. Hence, in leucophlegmatic habits, it proves a powerful expectorant, diuretic, and emmenagogue; and, if the patient is kept warm, ſudorific. It is alſo of great ſervice in humoral aſthmas and catarrhous diſorders of the breaſt, and in thoſe proceeding from a laxity of the ſolids, and a cold ſluggiſh ſtate of the fluids. It is alſo frequently of ſervice in the dropſy; in the beginning of which it is particularly recommended by Sydenham, as a warm ſtrengthening medicine; we have even many examples where it acts ſo powerfully as a diuretic, as to carry off all the water of dropſies. It may be taken to the extent of a dram or two in ſubſtance for a doſe.—We have a ſyrup and oxomel made with it, which may be employed for the ſame purpoſes as the garlic in ſubſtance; but they are moſtly uſed in pulmonic diſorders. Externally applied, it inflames and ulcerates the ſkin, and is ſometimes applied for this uſe in ſinapiſms. It has alſo been recommended by Sydenham as a moſt powerful repellent; for which purpoſe he was led to make uſe of it in the confluent ſmall-pox. His method was to cut the root in pieces, and apply it, tied in a linen cloth, to the ſoles of the feet, about the 8th day of the diſeaſe, after the face began to ſwell; renewing it once a-day till the danger was over.—When made into an unguent with oils, and applied externally, garlic is ſaid to reſolve and diſcuſs cold tumours, and has been by ſome greatly celebrated in cutaneous diſorders. The acrimonious qualities of this root, however, render it manifeſtly improper on many occaſions. Its liberal uſe is apt to occaſion head achs, flatulencies, thirſt, febrile heats, inflammatory diſtempers, and ſometimes diſcharges of blood from the hemorhoidal veſſels. In hot bilious conſtitutions, where there is already a degree of irritation, where the juices are too thin and acrimonius, or the viſcera unſound, it never fails to aggravate the diſtemper. Garlic is very hardy and will thrive in almoſt any ſoil or ſituation, and is eaſily propagated either by the roots or ſeeds.

Allium Schoenoprasum, or cives, is an inhabitant of Siberia, and is a very ſmall plant compared with the former, the leaves and ſtems ſeldom exceeding ſix inches in length, and the roots never producing any bulbs. The leaves are awl ſhaped, hollow, and the ſtem naked. Its taſte, ſmell, and virtues, are much the ſame as thoſe of the common onion. It is propagated by parting the roots.

Allium Scorodoprasum, or rokambole, grows naturally in Denmark and Sweden. It hath a heart-ſhaped ſolid root, which ſtands ſidewiſe of the ſtalk. The leaves are broad, and are a little crenated on their edges. The flowers are of a pale purple colour, and collected into a globular head. The roots are uſed for the ſame purpoſe as the former.

Allium urisnum, or wild garlic, is very common and uſeful, in Kamtſcatka for medicine as well as food. Both Ruſſians and natives gather it in great quantities for winter ſervice. They ſteep it in water, then mix it with cabbage, onions, and other ingredients, and form out of them a ragout which they eat cold. It is alſo the principal remedy for the ſcurvy. As ſoon as this plant appears above the ſnow, they ſeem to put this dreadful diſorder at defiance, and find a cure almoſt in its worſt ſtages.

ALLOCATION, *n. s.* 1. The act of putting one thing to another.—2. The admiſſion of an article in reckoning, and addition of it to the account.

ALLOCUTION, *n. s.* the act of ſpeaking to another.

ALLONGE, *n. s.* a paſs or thruſt with a rapier.

ALLOQUY, *n. s.* the act of ſpeaking to another; addreſs; converſation.

To ALLOT, *v. a.* 1. To diſtribute by lot.—2. To grant.—3. To diſtribute; to parcel out; to give each his ſhare.

ALLOTMENT, *n. s.* 1. That which is allotted to any one; the part; the ſhare, the portion granted.—2. Part appropriated.

To ALLOW, *v. a.* 1. To admit; not to contradict; not to oppoſe.—2. To juſtify to maintain as right.—3. To yield; to own any one's title to.—4. To grant licence; to permit.—5. To give a ſanction to; to authorize.—6. To give to; to pay to.—7. To appoint for; to ſet out to a certain uſe.—8. To make abatement, or proviſion; or to ſettle any thing, with ſome conceſſions or cautions regarding ſomething elſe.

ALLOWABLE, *adj.* 1. That which may be admitted without contradiction.—2. That which is permitted or licenſed; lawful; not forbidden.

ALLOWANCE, *n. s.* 1. Admiſſion without contradiction.—2. Sanction; licenſe; authority.—3. Permiſſion; freedom from reſtraint.—4. A ſettled rate; or appointment for any uſe.—5. Abatement from the ſtrict rigour of a law, or demand.

ALLOY, *n. s.* [ſometimes written *allay*.] 1. Baſer metal mixed in coinage. That preciſe weight and fineneſs, by law appropriated to the pieces of each denomination, is called the ſtandard. Fine ſilver is without the mixture of any baſer metal. *Alloy* is baſer metal mixed with it.—2. Abatement; diminution.

Alloy of gold is eſtimated by carats, that of ſilver by pennyweights. See Gold, &c. The only proper alloy for either, is copper, though ſilver is ſometimes mixed with gold. But the ſmalleſt particle of braſs would render gold brittle, and unmalleable; and there is an equal antipathy (ſo to ſpeak) between ſilver and tin or lead. If baſe metals, ſo near the colour of the fine ones, would mix with them ſo as to be wrought, there would be no end of impoſitions. In different nations, different proportions of alloy are uſed in coining; whence their money is ſaid to be of different degrees of fineneſs or baſeneſs, and is valued accordingly in foreign exchanges. In Britain, the ſtandard of gold coin is 22 *carats* of fine gold and 2 *carats* of *alloy*, in the pound troy; the French, Spaniſh, and Flemiſh gold are nearly of the ſame fineneſs. The ſtandard for ſilver is 11 oz. 2 pennyweights troy of ſilver, and 18 pennyweights of *alloy* of copper. In the United States, the ſtandard for gold coins is 11 parts fine to one part alloy, and accordingly 11 parts in 12 of the entire weight of ſuch gold coin conſiſts of pure gold, and the remaining one-twelfth part of alloy; the ſaid alloy conſiſting of ſilver and copper, not exceeding one half ſilver. The ſtandard for ſilver coins is 1485 parts fine, to 179 parts alloy; and accordingly, 1485 in 1664 parts of the entire weight of each coin conſiſts of pure ſilver, and the remaining 179 parts of alloy, wholly of copper. Laws of the U. S. 1ſt. Seſſ. 2. Cong. chap. 16. Whether gold or ſilver be above or below ſtandard, is to be found by aſſay. There are various reaſons alledged for the alloying of coin; but the moſt ſatisfactory appears to be the neceſſity of rendering them harder, to prevent the diminution of weight by wearing in paſſing from hand to hand.

Alloy, likewiſe, in a more general ſenſe, is employed in chemiſtry, to ſignify the union of different metallic matters. As an infinity of different combinations may be made according to the nature, the number and the proportions of the metallic matters capable of being alloyed, we ſhall not enter into a detail of the particular alloys, all which are not yet nearly known. Thoſe which are uſed, ſuch as *bronze*, *tombac*, *braſs*, *white copper*, &c. may be found under their particular names.

To Alloy, *v. a.* to mix, or debaſe metals.

ALL SAINTS, All-Saints-Bay, &c. See all ſuch articles under the compounds of All.

To ALLUDE, *v. n.* to have ſome reference to a thing, without the direct mention of it; to hint at; to inſinuate.

ALLUM. See Alum.

ALLUMY, *adj.* having the quality of alum.

ALLURE, *n. s.* ſomething ſet up to entice birds, or other things to it. We now write *lure*.

To Allure, *v. a.* to entice to any thing whether good, or bad; to draw toward any thing by enticement.

ALLUREMENT, *n. s.* that which allures, or has the force of alluring; enticement; temptation of pleaſure.

ALLURER, *n. s.* the perſon who allures; an enticer; an enveigler.

ALLURINGLY, *adv.* in an alluring manner; enticingly.

ALLURINGNESS, *n. s.* the quality of alluring or enticing; invitation; temptation by propoſing pleaſure.

ALLUSION, *n. s.* a hint; an imputation.

Allusion, in rhetoric, a figure whereby ſomething is applied to, or underſtood of another, on account of ſome ſimilitude between them.

ALLUSIVE, *adj.* hinting at ſomething not fully expreſſed.

ALLUSIVELY, *adv.* in an alluſive manner; by implication.

ALLUSIVENESS, *n. s.* the quality of being alluſive.

ALLUVION, *n. s.* 1. The carrying of any thing to ſomething elſe by the motion of the water.—2. The thing carried by water to ſomething elſe.

Alluvion, in law, denotes a gradual increaſe of land along the ſea ſhore, or the banks of large rivers.

In ALL WISE, *adv.* by all means.

ALLY, *n. s.* one united by ſome means of connexion.

To Ally, *v. a.* 1. To unite by kindred, friendſhip, or confederacy.—2. To make a relation between two things.

ALMACANTAR, *n. s.* a circle drawn parallel to the horizon. It is generally uſed in the plural, and means a ſeries of circles of the ſphere paſſing through the centre of the ſun, or a ſtar, parallel to the horizon, being the ſame as *parallels of Altitude*.

Almacantar's Staff, *n. s.* an inſtrument commonly made of pear-tree or box, with an arch of fifteen degrees, uſed to take obſervations of the ſun, about the time of its riſing and ſetting, in order to find the amplitude, and conſequently the variation of the compaſs.

ALMAGRA, in chemiſtry, red *bole* or ruddle; ſometimes a lotion, or waſh.

Almagra, in natural hiſtory, the *sil atticum* of the ancients, an ochre of a fine and deep red, with ſome mixture of purple, very heavy, and of a denſe yet friable ſtructure, and rough duſty ſurface. It adheres firmly to the tongue, melts eaſily in the mouth, and is of an auſtere and ſtrongly aſtringent taſte. It ſtains the ſkin, and ferments very violently with acid menſtruums; by which quality, it is ſufficiently diſtinguiſhed from the *sil syritum*, to which it has in many reſpects a great affinity. It is found in immenſe quantities, in many parts of Spain; and in Andaluſia there are in a manner whole mountains of it. It is uſed both in painting and in medicine, being a very valuable aſtringent.

ALMANACK, *n. s.* a book, or tables containing a calendar of days and months, the riſing and ſetting of the ſun, the age of the moon, the eclipſes of both luminaries, &c.

Almanacks, history of. All the claſſes of Arabs are commonly much given to the ſtudy of aſtronomy and aſtrology; to both which a paſtoral life, and a ſort of huſbandry not only incline them, but give them time and leiſure to apply themſelves. They neither ſow, reap, plant, travel, buy, ſell, nor undertake any expedition, without previouſly conſulting the ſtars, or, in other words, their almanacks. From theſe people, this art, no leſs uſeful in one ſenſe, than ridiculous in another, paſſed over to Europe, and thoſe aſtronomical compoſitions were, like them, for a long while, and ſtill are among many European nations, interſperſed with a great number of aſtrological rules for planting, ſowing, bleeding, purging, &c. down to the cutting of the hair and paring of the nails.—Regiomontanus appears to have been the firſt in Europe, however, who reduced almanacks into their preſent form and method, gave the characters of each year and months, foretold the eclipſes and other phaſes, calculated the motions of the planets, &c. His firſt almanack was publiſhed in 1474.—Almanacks differ from one another, chiefly in the number of particulars they contain. The eſſential part is the calendar of months and days, with the riſings and ſettings of the ſun, age of the moon, &c. To theſe are added various aſtronomical, meteorological, chronological, political, and rural parerga, &c. as calculations and accounts of eclipſes, ſolar ingreſſes, prognoſtics of the weather, tables of the tides, terms, &c. poſts, offices, magiſtrates, public inſtitutions, with many other articles, political as well as local, and differing in different countries. The modern almanack anſwers to the *Faſti* of the ancient Romans. See Fasti.

Almanacks, method of constructing. The firſt thing to be done is, to compute the place of the ſun and moon for each day of the year, or it may be taken from ſome ephemerides and entered into the almanack; next, find the dominical letter, and, by means thereof, diſtribute the calendar into weeks; then, having computed the time of eaſter, by it fix the other moveable feaſts; adding the immoveable ones, with the names of the martyrs, the riſing and ſetting of each luminary, the length of day and night, the aſpects of the planets, the phaſes of the moon, and the ſun's entrance into the cardinal points of the ecliptic, *i. e.* the two equinoxes and ſolſtices. See Astronomy. By the help of good aſtronomical tables or ephemerides, the conſtruction of almanacks is extremely eaſy.

ALMIGHTINESS, *n. s.* omnipotence; one of the attributes of God.

ALMIGHTY, *adj.* of unlimited power; omnipotent.

ALMOND, *n. s.* the fruit of the Almond Tree. See Amygdalus.

ALMONDS, among lapidaries, ſignify pieces of rock-cryſtal, uſed in adorning branch-candle-ſticks, &c. on account of the reſemblance they bear to the fruit of that name.

ALMONDS of the throat, or Tonsils, called improperly *Almonds of the ears*, are two round glands placed on the ſides of the baſis of the tongue, under the common membrane of the fauces.

ALMONER, or Almner, *n. s.* the officer of a prince, or other perſon, employed in the diſtribution of charity.

ALMOST, *adv.* nearly; well nigh.

ALMS, *n. s.* what is given gratuitouſly in relief of the poor.

Alms, in a legal ſenſe, lands or other effects left to churches or religious houſes, on condition of praying for the ſoul of the donor.

ALMS-BOX, a ſmall cheſt or coffer, with a hole in the upper part, fixed in a conſpicuous place in hoſpitals, &c. for the reception of ſuch alms, as the charitably diſpoſed may think proper to throw in.

ALMSDEED, *n. s.* an act of charity; a charitable gift.

ALMS-GIVER, *n. s.* he who gives alms; he who ſupports others by his charity.

ALMSHOUSE, *n. s.* a houſe devoted to the reception and ſupport of the poor.

ALMUCANTARS. See Almacantar.

Almucantar's-Staff. See Almacantar's Staff.

ALNAGE, *n. s.* ell meaſure, or meaſuring by the ell or yard.

ALNUS, in botany, the Alder-tree, a ſpecies of betula. See Betula.

ALOE, in botany, a gens of the monogynia order, belonging to the hexandria claſs of plants; and, in the natural method, ranking under the 10th order. Coronariæ.—The characters are: There is no calyx: The corolla is monopetalous, erect, ſix-cleft, and oblong; the tube gibbous; the border ſpreading, and ſmall: with a nectary-bearing bottom: The ſtamina conſiſt of ſix ſubulated filaments, rather ſurpaſſing the corolla, in length, and inſerted into the receptacle; the antheræ are oblong and incumbent: The piſtillum has an ovate germen; the ſtylus is ſimple, the length of the ſtamina: the ſtigma is obtuſe and trifid; The perecardium is an oblong capſule, three-furrowed, three celled, three-valved: The ſeeds are many and angular.

Aloe, the Great American. See Agave.

ALOES, *n. s.* 1. A precious wood uſed, in the Eaſt, for perfumes, of which the beſt ſort is of a higher price than gold.—2. A tree which grows in hot countries.—3. A medicinal juice extracted from the common *aloes* tree, by cutting the leaves, and expoſing the juice that drops from them to the ſun.

Aloes, manyfold uses of. The aloe is a kind of ſymbolic plant to the Mahometans, eſpecially in Egypt, and in ſome meaſure dedicated to the offices of religion; for whoever returns from a pilgrimage to Mecca, hangs it over his ſtreet-door, as a token of his having performed that holy journey. The ſuperſtitious Egyptians believe that this plant hinders evil ſpirits and apparitions from entering the houſe; and on this account, whoever walks the ſtreets in Cairo, will find it over the doors both of Chriſtians and Jews. From this plant the Egyptians diſtil a water, which is ſold in the apothecaries ſhops at Cairo, and recommended in coughs, hyſterics, and aſthmas. Of the leaves of the Guinea aloe, the negroes make very good ropes, not apt to rot in the water. Dr. Sloane mentions two ſorts of aloes, one of which is uſed for fiſhing lines, bow-ſtrings, ſtockings, and hammocks; the other has leaves which, like thoſe of the wild pine and banana, hold rain water, and therefore afford a very neceſſary refreſhment to travellers in hot countries, where there is generally a ſcarcity of wells and water. The *Magueí*, a ſpecies of aloe, in Mexico, yields almoſt every thing neceſſary to the life of the poor in that country. Beſides making excellent hedges for their fields, its trunk ſerves in place of beams for the roofs of their houſes, and its leaves inſtead of tiles. From thoſe leaves they obtain paper.

others extending, with lowering progreſs, even into Nova Scotia. The main chain paſſes through the ſtate of New-York, where it is diſtinguiſhed by the name of the *Highlands*, and lies within 40 miles off the Atlantic. From thence it recedes from the ſea, in proportion as it advances ſouthward; and near its extremity in South Carolina is 300 miles diſtant from the water. It conſiſts of ſeveral parallel ridges, divided by moſt enchanting vallies, and generally cloathed with variety of woods. Theſe ridges riſe gradually from the Eaſt, one above the other, to the central; from which they gradually fall to the Weſt, into the vaſt plains of the Miſſiſſippi. The middle ridge is of an enormous bulk and height. The whole extends in breadth about 70 miles; and in many places leaves great chaſms for the diſcharge of the vaſt and numerous rivers which riſe in the boſoms of the mountains, and empty themſelves into the Atlantic Ocean, after yielding a matchleſs navigation to the provinces they water. Beyond that branch of the Apalachian mountains called *The Endleſs*, is another of amazing extent, nearly as high as the mountains themſelves. This plain, called the *Upper Plains*, is exceedingly rich land: begins at the Mohock River; reaching to within a ſmall diſtance of Lake Ontario; and to the Weſtward forms part of the extenſive plains of the Ohio, and reaches to an unknown diſtance beyond the Miſſiſippi.

ALSACE, LOWER and UPPER, a ci-devant province of France, now included in the department of the Lower and Upper Rhine. It is bounded on the E. by the Rhine, on the S. by Swiſſerland, on the W. by Lorrain, and on the N. by the palatinate of the Rhine. It is one of the moſt fruitful and plentiful provinces of Europe, abounding in corn, wine, wood, flax, tobacco, pulſe, fruits, &c.

ALSIMBEL, in the materia medica, a name given, by Avicenna and others, to the ſpikenard of India.

ALSINA, in botany, a ſynonime of the theligonum. See THELIGONUM.

ALSINE, or CHICKWEED: A genus of the trigynia order, belonging to the pentandria claſs of plants; and in the natural method, ranking under the 22d order, Caryophyllei. The characters are: the calyx is quinquephyllous: the corolla conſiſts of five equal petals, longer than the calyx: The ſtamina conſiſt of five capillary filaments; the antheræ are roundiſh: The piſtillum has an oval germen, three filiform ſtyli, and obtuſe ſtigmata: The pericarpium is an ovate unilocular capſule, with three valves: The ſeeds are roundiſh and numerous. Of this genus a great number of ſpecies are enumerated by ſome botanical writers; but none of them poſſeſs any remarkable properties, except the

ALSINE MEDIA, or common chickweed, with white bloſſoms, ſo well known as to need no particular deſcription.—This ſpecies affords a notable inſtance of what is called the *ſleep of plants*: for, every night, the leaves approach in pairs, ſo as to include within their upper ſurfaces the tender rudiments of the new ſhoots; and the uppermoſt pair but one at the end of the ſtalk are furniſhed with longer leaf ſtalks than the others; ſo that they can cloſe upon the terminating pair, and protect the end of the branch. The young ſhoots and leaves, when boiled, can hardly be diſtinguiſhed from ſpring ſpinach.—They are deemed refrigerating and nutritive, and an excellent food for perſons of a conſumptive habit of body.—Swine are extremely fond of chickweed; cows and horſes eat it; ſheep are indifferent to it; and goats refuſe it.

ALSO, *adv.* 1. In the ſame manner; likewiſe. 2. *Alſo* is ſometimes nearly the ſame with *and*, and only conjoins the members or the ſentence.

ALSTONIA, in botany, a genus of the monogynia order, belonging to the hexandria claſs of plants. The characters are: The calyx is a perianthium beneath, imbricated: The corolla is monopetalous, and ſhorter than the calyx; the border expanding, eight or ten parted, with alternate diviſions: The ſtamina conſiſt of numerous ſhort filaments, the exterior ones longer; the antheræ are orbicular and furrowed: The piſtillum has a ſmall ovate germen above; a ſimple ſtylus the length of the corolla, filiform and erect; the ſtigma inverſe egg-headed. There is but one ſpecies, viz.

ALSTONIA THEAFORMIS, a native of America.

ALSTROEMERIA, in botany: A genus of the monogynia order, belonging to the hexandria claſs of plants, and, in the natural method, ranking under the 11th order, Sarmentaceæ. The characters are: There is no calyx: The corolla is nearly bilabiated; and conſiſts of ſix petals, the two inferior tubular at the baſe: The piſtillum has an hexangular germen beneath; the ſtylus declining, filiform, the length of the ſtamina; and three oblong bifid ſtigmata: The pericarpium is a roundiſh hexangular capſule, with three cells and three valves: The ſeeds are globular and numerous. There are five ſpecies, natives of Italy and Peru.

ALTAHEST, in chemiſtry, a mixed body reduced to its firſt principles.

ALTAR, *n. s.* 1. The place where offerings to heaven are laid.—2. The table in Chriſtian churches where the communion is adminiſtered.

ALTARS, ANTIQUITY OF. Altars are doubtleſs as ancient as ſacrifices themſelves; conſequently their origin is not much later than that of the world; Gen. ch. iv. Some attribute their origin to the Egyptians; others to the Jews; others to the patriarchs before the flood. Some carry them as far back as Adam, whoſe altar is much ſpoken of by Jewiſh, and even Chriſtian writers. Others are contented to make the patriarch Enoch the firſt who conſecrated a public altar. Be this as it will, the earlieſt altars we find any expreſs teſtimony of are thoſe erected by Abraham.—Altars, in the patriarchal times, were very rude. The altar which Jacob ſet up at Bethel was nothing but a ſtone, which ſerved him inſtead of a bolſter: that of Gideon, a ſtone before his houſe: and the firſt which God commanded Moſes to erect was probably of earth, or unpoliſhed ſtones, without any iron; for if any uſe was made of that metal, the altar was declared impure.

ALTARS, CHRISTIAN. In the primitive church the altars were only of wood, as being frequently to be removed from place to place. But the council of Paris, in 509, decreed that no altar ſhould be built but of ſtone.—At firſt there was but one altar in each church; but the number ſoon increaſed; and from the writings of Gregory the Great, who lived in the 6th century, we learn, that there were ſometimes in the ſame church 12 or 13. In the cathedral of Magdeburg there are no leſs than 49 altars.

ALTARS, JEWISH. The principal altars of the Jews were, the altars of *incenſe*: that of *burnt-offering*; and the *altar* or *table, for the ſhew-bread.* 1. The *altar of incenſe* was a ſmall table of ſhittimwood, covered with plates of gold, of one cubit in length, another in width, and two in height. At the 4 corners were four kinds of horns, and all round a little border or crown over it. This was the altar hidden by Jeremiah before the captivity; and upon it the officiating prieſt offered, every morning and evening, incenſe of a particular compoſition. 2. The *altar of burnt-offerings* was made of ſhittimwood, and carried upon the ſhoulders of the prieſts by ſtaves of the ſame wood overlaid with braſs. In the time of Moſes, this altar was five cubits ſquare and three high; but in Solomon's temple it was much larger, being 20 cubits ſquare and 10 in height. It was covered with braſs; and at each corner was a horn or ſpire; wrought out of the ſame wood with the altar, to which the ſacrifices were tied. Within the hollow was a grate of braſs, on which the fire was made; through it fell the aſhes, and were received in a pan below. At the four corners of the grate were four rings and four chains, which kept it up at the horns. This altar was placed in the open air, that the ſmoke of the burnt-offerings might not ſully the inſide of the tabernacle. 3. The *altar,* or *table* for the *ſhew-bread,* was likewiſe of ſhittimwood, covered with plates of gold, having a little border round it, adorned with ſculpture. It was two cubits long, one wide, and one and a half in height. Upon this table, which ſtood in the holy of holies, were put, every ſabbath day, 12 loaves, with ſalt and incenſe. The Jewiſh altars, after their return from the captivity, and the building of the other temple, were in ſome reſpects different from thoſe deſcribed above. That of burnt-offerings was a large pile, built of unhewn ſtone, 32 cubits ſquare at the bottom, and 24 ſquare at the top. The aſcent was by a gentle riſing, 32 cubits in length, and 16 in breadth.

Altars, Pagan, were made by the heathens at firſt only of turf; afterwards they were made of ſtone, of marble, of wood, and even of horn, as that of Apollo in Delos. Altars differed in figure as well as in materials. Some were round, others ſquare, and others triangular. All of them were turned towards the eaſt, and ſtood lower than the ſtatues of the gods; and were generally adorned with ſculpture, repreſeting either the gods to whom they were erected, or their ſymbols. The height of altars alſo differed according to the different gods to whom they ſacrificed. In the great temples of ancient Rome there were ordinarily three altars: The firſt was placed in the ſanctuary, at the foot of the ſtatue of the divinity, upon which incenſe was burnt and libations offered; the ſecond was before the gate of the temple, and upon it they ſacrificed the victims; and the third was a portable altar, upon which were placed the offering and the ſacred veſſels. Beſides theſe uſes of altars, the ancients ſwore upon them, and ſwore by them, in making alliances, confirming treaties of peace, and other ſolemn occaſions. Altars alſo ſerved as places of refuge to all thoſe who fled to them, whatever crimes they had committed.

ALTENA, a ſea-port town of Germany, in the duchy of Holſtein, in Lower Saxony, ſeated on the Elbe, 2 miles N. W. of Hamburg. A variety of manufactures are carried on here and a briſk trade; it being a free port, and the Elbe having ſufficient depth of water to admit ſhips of burden to come up to the merchants warehouſes. It contains about 40,000 inhabitants. The merchandiſe brought from Aſia, by the Daniſh Eaſt India company, is ſold here. Long. 85. 3. E. Lat. 53. 56. N.

ALTENBURG, an ancient town of Germany, ſituated on the river Pleiſs, 20 miles S. of Leipſick, with a good caſtle placed on a rock, in Miſnia, in the circle of the Upper Saxony. Here is a college which has always been in a flouriſhing condition. In 1705, there was a nunnery founded for women of a high rank, who are Proteſtants. Long. 87. 28. E Lat. 50. 69. N.

To ALTER, *v. a.* 1. To change; to make otherwiſe than it is.—2. To take off from a perſuaſion, practice, or ſect.

To Alter, *v. n.* to become otherwiſe than it was.

ALTERABLE, *adj.* that which may be altered or changed by ſomething elſe; diſtinct from changeable, or that which changes, or may change itſelf.

ALTERABLENESS, *n. s.* the quality of being alterable, or admitting change from external cauſes.

ALTERABLY, *adv.* in ſuch a manner as may be altered.

ALTERAGE, *n. s.* the breeding, nouriſhing, or foſtering of a child.

ALTERANT, *adj.* that which has the power of producing changes in any thing.

ALTERANTS, or alterative medicines, ſuch as correct the bad qualities of the blood and other humours, without occaſioning any ſenſible evacuation.

ALTERATION, *n. s.* 1. The act of altering or changing.—2. The change made.

Alteration, in phyſics, the act of changing the circumſtances and manner of a thing; its general nature and appearance remaining the ſame. Or, an accidental and partial change in a body; without proceeding ſo far as to make the ſubject quite unknown, or to take a new denomination thereupon. Or, it may be defined, the acquiſition or loſs of ſuch qualities as are not eſſential to the form of the body. Thus, a piece of iron, which before was cold, is ſaid to be altered, when it is made hot; ſince it may ſtill be perceived to be iron, is called by that name, and has all the properties thereof. By this *alteration* is diſtinguiſhed from *generation* and *corruption;* thoſe terms expreſſing an acquiſition or loſs of the eſſential qualities of a thing. The modern, philoſophers, after the ancient chemiſts and corpuſcularians. hold all alteration to be effected by means of local motion, According to them, it always conſiſts either in the emiſſion acceſſion, union, ſeparation, or tranſpoſition, of the component particles.

ALTERATIVE, *adj.* medicines called *alteratives,* are ſuch as have no immediate ſenſible operation, but gradually gain upon the conſtitution, by changing the humours from a ſtate of diſtemperature to health. They are oppoſed to *evacuants.*

ALTERCATION, *n. s.* debate: controverſy; wrangle. Or it may be more particularly defined, a debate between two friends and acquaintance. The word comes from *altercari,* which anciently ſignified to converſe or hold diſcourſe together. Thus, we ſay, They never come to an open quarrel, but there is continually ſome little *altercation* or other.

ALTERN, *adj.* acting by turns, in ſucceſſion each to the other.

ALTERNACY, *n. s.* actions performed by turns.

ALTERNATE, *adj.* being by turns; one after another; reciprocal.

Alternate, in botany, when the leaves or branches of plants ariſe higher on oppoſite ſides alternately.

Alternate, *n. s.* that which happens alternately; viciſſitude.

To Alternate, *v. a.* 1. To perform alternately.—2. To change one thing for another reciprocally.

ALTERNATELY, *adv.* in reciprocal ſucceſſion, ſo that each ſhall be ſucceeded by that which it ſucceeds, as light follows darkneſs, and darkneſs follows light.

ALTERNATENESS, *n. s.* the quality of being alternate, or of happening in reciprocal ſucceſſion.

ALTERNATION, *n. s.* the reciprocal ſucceſſion of things. Alternation in numbers, is uſed to expreſs the different changes or alterations of orders in any number of things propoſed. This is alſo called *permutation*, &c. and is eaſily found by a continual multiplication of all the numbers, beginning at unity. Thus, if it be required to know how many changes or alterations can be rung on ſix bells, multiply the nnmbers 1, 2, 3, 4, 5, 6, continually into one another; and the laſt product gives the number of changes. See Aithmetic.

ALTERNATIVE, *n. s.* the choice given of two things; ſo that if one be rejected, the other muſt be taken.

ALTERNATIVELY, *adv.* in alternate manner, by turns; reciprocally.

ALTERNITY, *n. s.* reciprocal ſucceſſion; viciſſitude; turn; mutual change of one thing for another; reciprocation.

ALTHÆA, Marshmallow: A genus of the polyandria order, belonging to the monodelphia claſs of plants; and, in the natural method, ranking under the 37th order, *Columniferæ*. The characters are: The *calyx* is a double perianthium, the exterior one nine-cleft: The *corolla* conſiſts of five petals, coaleſced at the baſe: The *ſtamina* conſiſt of numerous filaments inſerted into the corolla; the antheræ are kidney ſhaped. The *piſtillum* has an orbicular germen; a ſhort cylindrical ſtylus; and numerous briſtly ſtigmata, the length of the ſtylus: The *pericarpium* conſiſts of numerous arillæ: The *ſeeds* are ſolitary, and kidney ſhaped. There are three ſpecies, viz.

1. Althæa Cannabina, or ſhrubby marſhmallow, is a native of Hungary and Iſtria. It has a woody ſtem, which riſes to the height of 4 or 5 feet; and puts out many ſide branches. The flowers come out in the ſame manner as in the others, but are of a deeper red colour. This ſort ſeldom flowers the firſt year, unleſs the ſummer proves warm; but when the plants live through the winter, they will flower early in the following ſummer, and produce good ſeeds.—The ſeeds ought to be ſown where the plants are to remain, as the roots ſhoot deep in the ground, and unleſs the plants are moved very young they ſeldom ſurvive. They ſhould have a ſheltered ſituation and a dry ſoil, otherwiſe they will not live through the winter.

2. Althæa hirsuta, or hairy marſhmallow, is a native of Spain and Portugal. It is a low plant, whoſe branches trail on the ground, unleſs they are ſupported by ſtakes.—The leaves and ſtalks are beſet with ſtrong hairs, the flowers come out like thoſe of the common ſort, but are ſmaller, and have purpliſh bottoms. The ſeeds of this ſpecies ought to be ſown in the places, where they are to remain, as the roots ſhoot deep like that of the Cannabina.

3. Althæa vulgaris, or common marſhmallow, is a native of Britain and very common in the United States, and hath a perennial root, and an annual ſtalk, which periſhes every autumn. The ſtalks grow erect to the height of 4 or 5 feet. Theſe are garniſhed with leaves which are hoary, ſoft to the touch, and placed alternately on the branches. The flowers come out from under the wings of the leaves, like the mallow, and are of a purpliſh white.—Though this ſpecies is found naturally in ſalt marſhes, it will thrive in almoſt any ſoil, or in any ſituation: however, it will always grow larger in moiſt than in dry ſoil. It may be propagated either by parting the roots in autumn when the ſtalks decay, or by ſowing the ſeeds in the ſpring.

Althæa frutex. See Hibiscus.

Althæa, medical uses of. The althæa vulgaris, § 3, is the only ſpecies uſed in medicine. The whole plant, eſpecially the root, abounds with a mild mucilage. It has the general virtue of an emollient medicine; and proves ſerviceable in a thin acrimonious ſtate of the juices, and where the natural mucus of the inteſtines is abraded. It is chiefly recommended in ſharp defluxions upon the lungs, hoarſeneſs, dyſenteries; and likewiſe in nephritic and calculous complaints; not, as ſome have ſuppoſed, that this medicine has any peculiar power of diſſolving or expelling the calculus; but as, by lubrucating and relaxing the veſſels, it procures a more free and eaſy paſſage. The root is ſometimes employed externally for ſoftening and maturing hard tumours; chewed, it is ſaid to give eaſe in difficult dentition of children. This root gives name to an officinal ſyrup, decoction, and ointment and was likewiſe an ingredient in the compound powder of gum tragacanth and the oil and plaſter of mucilages. But of all theſe formulæ the ſyrup alone is now retained.

ALTHOUGH, *conj.* Notwithſtanding; however it may be granted; however it may be that.

ALTIMETRY, *n. s.* the art of taking or meaſuriug altitudes or heights, whether acceſſible or inacceſſible, generally performed by a quadrant. See Geometry.

ALTIN, a lake in Siberia, from whence iſſues the river Ob, or Oby, in Lat. 52. 0. N. Long. 160. 55. E. This lake is called by the Ruſſians *Teloſkoi Oſero*, from the Teleſſi, a Tartarian nation, who inhabit the borders of it, and who give it the name of *Altin Kul*. By the Kalmucks it is called *Altinnor*. It is ſaid to be 90 miles long and 50 broad, with a rocky bottom; though ſome geographers ſtate it as only 18 miles long and 12 broad. The north part of it is ſometimes frozen ſo hard as to be paſſible on foot, but the ſouthern part is never covered with ice. The water in the Altin lake, as well as in the rivers which run in through the adjacent places, only riſes in the middle of ſummer, when the ſnows on the mountains are melted by the heat of the ſun. This may account for the different calculations of its extent.

ALTINCAR, among mineraliſts, a ſpecies of factitious ſalt uſed in the fuſion and purification of metals. The altincar is a ſort of flux powder. Divers ways of preparing it are given by Libavius.

ALTITUDE, *n. s.* [*altitudo*, Lat.] 1. Height of place;

ſpace meaſured upward.—2. The elevation of any of the heavenly bodies above the horiſon.—3. Situation with regard to lower things.—4. Height of excellence; ſuperiority.—5. Height of degree; higheſt point.

Altitude, accessible, and inaccessible. See Geometry. The method of taking conſiderable terreſtrial altitudes, of which thoſe of mountains are the greateſt, by means of the barometer, is very eaſy and expeditious. It is done by obſerving, on the top of the mountain, how much the mercury has fallen below what it was at the foot of the mountain. See Barometer.

Altitude, in aſtronomy, is the diſtance of a ſtar, or other point, in the mundane ſphere, from the horizon — This altitude may be either *true* or *apparent*.—If it be taken from the rational or real horizon, the altitude is ſaid to be true or real; if from the apparent, or ſenſible horizon, the altitude is apparent.—Or rather, the apparent altitude is ſuch as it appears to our obſervation; and the *true* is that from which the refraction has been ſubtracted. The true altitudes of the ſun, fixed ſtars, and planets differ but very little from their apparent altitudes; becauſe of their great diſtance from the centre of the earth, and the ſmallneſs of the earth's ſemidiameter, when compared thereto. But the difference between the true and apparent altitude of the moon is about 52′. See Astronomy.

Altitude, in aſtrology, denotes the ſecond of the five eſſential dignities which the planets acquire in virtue of the ſigns they are found in. In this ſenſe, *altitude* is otherwiſe called *exaltation.*

Altitude Instrument, or *Equal Altitude Instrument*, is that uſed to obſerve a celeſtial object when it has the ſame altitude on the E. and W. ſide of the meridian. See Astronomy.

ALTO, in muſic, the counter tenor.

ALTOGETHER, *adv.* 1. Completely; without reſtriction; without exception.—2. Conjunctly; in company.

ALTO Octavo, in muſic, imports that the part is to be played eight notes higher.

Alto relievo. See relievo.

ALTORF, a town of Germany in the circle of Franconia, and territory of Nuremberg. It has a phyſic garden, with 2000 different plants; a theatre for diſſections, which has many curioſities in the anatomical way; and a handſome library. It is ſubject to the houſe of Brandenburg; and is ſeated on the confines of Bavaria, 15 miles E. from Nuremberg. Long. 86. 29. E. Lat. 47. 20. W.

ALTO ripieno, in muſic, the tenor of the great chorus which ſings and plays only now and then in ſome particular places.

ALUDEL, *n. s.* *Aludels* are ſubliming pots uſed in chemiſtry, without bottoms, and fitted into one another, as many as there is occaſion for, without luting.

ALVEARIUM, an Alveary, or bee-hive. Some of the ancients uſe alſo the word *alvearium* for a bee-houſe, more uſually called *apiary.*

Alvearium, in anatomy, the bottom of the *ancha* or hollow of the auricle, or outer ear.

Alvearium, in literature, is uſed figuratively, for a collection; in which ſenſe *alvearium* amounts to the ſame with *theſaurus, cornucopia*, or the like. Vinc. Boreus has publiſhed an *alvearium of law.*

ALVEOLI, among naturaliſts, thoſe waxen cells in the combs of bees, wherein their honey is depoſited.

Alveoli, in anatomy, thoſe little ſockets in the jaws, wherein the teeth are ſet.

ALVEOLUS, in natural hiſtory, a ſea foſſil of a conic figure, compoſed of a number of cells, like bee-hives, joined into each other, with a pipe of communication.

ALVEUS, in anatomy, the tumid lacteal branches ariſing from the *receptaculum chyli* under the *diaphragm.*

ALUM, *n. s.* a kind of mineral ſalt, of an acid taſte, leaving in the mouth a ſenſe of ſweetneſs, accompanied with a conſiderable degree of aſtringency. The ancient naturaliſts allow of two ſorts of *alum*, natural and factitious. The natural is found in the iſland of Milo, being a kind of whitiſh ſtone, very light, friable, and porous, and ſtreaked with filaments reſembling ſilver. England, Italy, and Flanders, are the countries where *alum* is principally produced; and the Engliſh *rocbe-alum* is made from a bluiſh mineral ſtone, in the hills of Yorkſhire and Lancaſhire.—*Saccbarine alum* is a compoſition of common *alum*, with roſe water and whites of eggs, boiled together, to the conſiſtence of a paſte, and thus moulded at pleaſure. As it cools, it grows hard as a ſtone.—*Burnt alum* is *alum* calcined over the fire.—*Plumoſe* or *plume alum* is a ſort of ſaline mineral ſtone, of various colours, moſt commonly white, bordering on green; it riſes in threads or fibres, reſembling thoſe of a feather; whence its name from *pluma*, a feather.—By long beating the white of an egg with a lump of *alum*, you may bring it, for the moſtpart into white curds.

Alum, different kinds of. Moſt of the alum to be met with is artificially prepared by the methods related in their proper place under the article Chemistry, or by others ſimilar to them; though ſometimes a ſmall quantity is produced naturally. This native alum is mixed with heterogeneous matters, or effloreſces in various forms upon the ores during calcination. It rarely occurs in a cryſtallized ſtate, though it is ſaid to be thus met with in Egypt, Sardinia, Spain, Bohemia, and other places. It is alſo found in the waters, impregnated with fixed air, but very ſeldom in fountains or hot medicated waters. There are ſeveral kinds of alum to be met with; but theſe differ from one another only in being mixed with ſome ſalts which are not of the aluminous kind. The *Roman* alum has been conſidered as preferable to any other. It is uſually met with in ſmall cryſtals, and has a reddiſh colour, moſt probably owing to a ſmall quantity of calx of iron, which, however, does not in the leaſt impair its qualities. The other kinds of alum contain a portion either of vitriolated tartar or ſal ammoniac, according to the nature of the alkali uſed in its preparation. Sir Torbern Bergman informs us, that the vegetable alkali, if pure, does not hurt the alum, though it be added in the preparation; but that the volatile alkali, by adulterating it with a portion of vitriolic ſal ammoniac, renders it unfit for ſome purpoſes. The alum, made by adding a portion of clay to the liquor at the beginning of the boiling, he conſiders as equal, if not ſuperior, to Roman alum. He informs us alſo, that a kind of alum ſome time ago began to be manufactured at Brunſwick, which was equal in quality to the Roman alum. On a chemical analyſis of this alum he found it mixed with cobalt.

ALUMINOUS,

ALUMIMOUS, *adj.* relating to alum, or conſiſting of alum.

Alum mines are ſaid to have been firſt found in Italy, in 1460. In 1608, the manufacture of alum was firſt invented, and ſucceſsfully practiſed in England, meeting with great encouragement in Yorkſhire, were it was firſt made. King James I. by advice of his miniſtry, aſſumed the monopoly of it to himſelf, and therefore prohibited the importation of foreign alum; and in 1525, the importation of it was further prohibited by the proclamation of Charles I.

Alum stone, *n. s.* a ſtone or calx uſed in ſurgery; perhaps alum calcined, which then becomes corroſive.

Alum, uses of, in Arts. This ſalt is extremely uſeful in the art of dying; as by means of it a great number of colours are fixed and rendered permanent upon cloth, which otherwiſe would either not adhere in any degree, or only for a very ſhort time. In what manner this is accompliſhed we are ignorant. See the conjectures and theories on this ſubject under Dying. It conſtitutes the baſis of crayons, which generally conſiſt of the earth of alum finely powdered and tinged for the purpoſe. In the preparation for Pruſſian blue, it prevents the baſis of martial vitriol, which is ſoluble in acids, from being precipitated by the ſuperfluous alkali employed in the preparation of that pigment; that is, the alkali which is not ſaturated by the colouring matter. As this baſis adheres more ſtrongly than the clay to the vitriolic acid, and would form a green by the mixture of its yellowneſs, the white earth of alum, likewiſe, according to its quantity, dilutes the darker colours, even black itſelf, and produces an infinite number of ſhades. It is alſo of uſe in the making of candles; for being mixed with the tallow, it gives it an hardneſs and conſiſtence which it has not naturally. Wood ſufficiently ſoaked in a ſolution of alum does not eaſily take fire, and the ſame is true of paper impregnated with it; which for that reaſon is very properly employed in preſerving gun-powder, as it alſo excludes the moiſture of the air. Paper impregnated with allum is uſeful in whitening ſilver, and ſilvering braſs without heat. Alum is alſo of uſe in tanning, where it aſſiſts in reſtoring the coheſion of the ſkins almoſt entirely deſtroyed by lime. Vintners fine down their wines, &c. with alum; fiſhers uſe it to dry cod-fiſh with; and bakers have mixed it with the flour to make their bread compact and white: to this laſt uſe of it great objections have been made, but unjuſtly, for it is entirely innocent.

Alum, utility of, in Medicine. In medicine it is of conſiderable uſe as an aſtringent and tonic. It is reckoned particularly ſerviceable for reſtraining hæmorrhages, and immoderate ſecretions from the blood; but leſs proper in inteſtinal fluxus. In violent hæmorrhages it may be given in doſes of 15 or 20 grains, and repeated every hour or half hour till the bleeding abates: in other caſes, ſmaller doſes are more adviſeable; large ones being apt to nauſeate the ſtomach, and occaſion violent conſtipulations of the bowels. It is uſed alſo externally, in aſtringent and repellent lotions and collyria. Burnt alum taken internally has been highly extolled in caſes of cholic. In ſuch inſtances, when taken to the extent of a ſcruple for a doſe, it has been ſaid gently to move the belly, and give very great relief from the ſevere pain. Its official preparations are, for internal uſe, *pulvis stypticus*, and *aqua styptica* for external applications, the *aqua aluminis*, *coagulum aluminis* and *alumen ustum*; which laſt is no other than the alum dried by fire, or freed from the watery moiſture, which, like other ſalts, it always retains in its cryſtalline form. By this loſs of its water it becomes ſharper, ſo as to act as a ſlight eſcharotic; and it is chiefly with this intention that it is employed in medicine, being very rarely taken internally. For theſe preparations, ſee Pharmacy.

Alum works, places where alum is prepared, and manufactured in quantities for ſale. They differ from alum mines, as in the former an artificial alum, and in the latter natural alum, is produced.

ALVUS, in anatomy, a term uſed for the belly in general, but more frequently applied to the bowels.

ALWAYS, *adv.* [It is ſometimes written *alway*.] 1. Perpetually; throughout all time.—2. Conſtantly; without variation.

ALYPUM, in botany, a name given by ſome authors, to a ſpecies of ſpurge, the *tithymalus amygdaloides angustifolius*, or narrow-leaved almond ſpurge of Tournefort. Alypum is likewiſe a name given by ſome authors to a ſpecies of dog's-bane, diſtinguiſhed by Mr. Tournefort, by the name of the purple flowered ſea *apocynum* of Venice, with willow like leaves. Alypum is applied alſo to the *globularia* of Linnæus.

Alypum, in medicine, a word uſed by Galen, for a minorative, or medicine that gently purges.

ALYSSUM, Allyson, or Allysoides, Mad-wort; [from the Greek word *alusso*, *to be mad*; becauſe it was believed to have the property of curing madneſs.] A genus of the Siliculoſa, belonging to the tetradynamia claſs of plants: and, in the natural method, ranking under the 39th order, ſiliquoſa. The characters are: The calyx is an oblong four-leaved perianthium: The corolla conſiſts of four cruciform petals; with claws the length of the calyx, the petals ſhorter: the ſtamina conſiſt of ſix filaments, the length of the calyx, two of them rather ſhorter and denticulated; the antheræ are erect and expanding: The piſtillum has an ovate germen; the ſtylus is ſimple, and the length of the ſtamina: the ſtigma is obtuſe: The pericarpium is a ſub-globular emarginated ſilicle, furniſhed with a bilocular ſtylus, having an elliptic partition: The ſeeds are few, orbicular and fixed to filiform receptacles. Of this genus, Linnæus enumerates 19 ſpecies; but none of them are remarkable either for beauty, or any other property, except the following:

Alyssum Halimifolium, or madwort with whole ſpear-ſhaped leaves. This ſpreads itſelf upon the ground, and never riſes to any height. It produces, at the extremity of its branches, very pretty tufts of ſmall white flowers; of which it is ſeldom deſtitute for ſix or ſeven months ſucceſſively; for which reaſon it well deſerves a place in the gardens of the curious. The halimifolium ſeldom continues above two or three years, and muſt therefore be often ſown to preſerve it; or if the ſeeds are ſuffered to fall, the plants will riſe without any trouble. It may alſo be propagated by cuttings, which ought to be planted in April or May, and are very apt to take root, if kept ſhaded in the heat of the day, and gently refreſhed with water. It is not now uſed in medicine. This plant, as already obſerved, was thought to cure ſome kinds of madneſs; but the preſent practice has entirely refuſed it, for this or any other purpoſe.

A. M. ſtands for *artium magiſter*, or maſter of arts ; the ſecond degree of our univerſities, which, in ſome foreign countries, is called doctor of philoſophy.

AMABILITY, *n. s.* lovelineſs ; the power of pleaſing.

AMADABAT, a large and populous city of Indoſtan, and the capital of the province of Guzerat. It is ſituated 120 miles N. of Surat, and 40 N. E. of Cambaya. It was the ſeat of the Guzurat kings, as it is now of the Mogul viceroy, who lives very ſplendidly, and maintains 50 elephants and 12,000 horſes ! The city ſtands in a beautiful plain ; and including the ſuburbs, is about 4 miles and a half long. The ſtreets are wide. The king's ſquare is 700 paces long, and 400 broad, planted round with trees. On the W. ſide is the caſtle, well walled with free ſtone, and as ſpacious as a little city ; but its inward appearance is not conformable to its external magnificence. The caravanſera is on the ſouth of the ſquare, and is its chief ornament. Near the meydan alſo is the king's palace, whoſe apartments are richly ornamented : and in the midſt of the city is the Engliſh factory, where they ſell fine chintz, calicoes, and other Indian merchandize. The place is ſo full of gardens, ſtored with fruit trees, that from an eminence it looks like a wood. The Gentoos have here an hoſpital for ſick beaſts, and another for ſick birds, which they take great care of. According to ſome late accounts, this city is little inferior to the beſt in Europe, and is thought to yield ten times as much revenue as Surat. Long. 147. 22. E. Lat. 23. 10. N.

AMADETTA, *n. s.* a ſort of pear, ſo called, ſays Skinner, from the name of him who cultivated it.

AMADOT, *n. s.* a ſort of pear.

AMAIN, *adv.* with vehemence.

AMAIN, or AMAYNE, in ſea language, a term uſed importing to lower ſomething, either at once or by degrees. Thus, to *ſtrike amain*, is to lower, or let fall, the top ſails ; to *wave amain*, is to make a ſignal, by waving a drawn ſword, or the like, as a demand that the enemy ſtrike their top ſails.

AMALFI, an ancient city of Italy, ſituated on the bay of Salerno, 10 miles W. from that city. It is ſaid to have derived its origin from a number of Roman families, who, about the middle of the 4th century, either from private views of emolument, or in conſequence of compulſory orders from the emperor, had left Rome and embarked for Conſtantinople ; but meeting with ſtorms on their paſſage, were caſt away on the ſhores of Salerno, and deprived of the means of purſuing their voyage. In this ſtate of perplexity they long remained, but at laſt came to the reſolution of ſettling on the preſent ſite of Amalfi, where they expected to enjoy ſecurity and ſufficient of the neceſſaries of life. The earlieſt notice of them in this ſettlement dates no higher than the latter end of the 6th century. Inpervious mountains and inacceſſible coaſts preſerved their infant ſtate from the firſt fury of the Lombards, who ſeldom attempted the conqueſt of a maritime people. In 825, when this little republic had, under the patronage of the eaſtern emperors, attained a degree of wealth and reputation ſufficient to excite the avarice or ambition of its neighbours, Sico, prince of Salerno, marched a body of troops by night ; ſurpriſed Amalfi ; and, carrying off the greateſt part of the inhabitants, compelled them to fix at Salerno, which had lately ſuffered a great loſs of people by an epidemical diſorder. But before the 4th year of their captivity was expired, the Amalfitans took advantage of the abſence of the Salernian chiefs, who were then carrying on a war with the Beneventans ; armed themſelves, and, after burning and plundering Salerno, marched in triumph back to their own country. Here they framed a better ſyſtem of government, and reformed many abuſes in their former legiſlation ; adopting various meaſures to promote internal concord, and defeat the intention of foreign enemies. Their firſt plan was to veſt the ſupreme authority in a temporary prefect; but the experience of a few years led them to place that power in the hands of a duke elected for life. Under theſe governors Amalfi attained the ſummit of her military and commercial glory ; and extended its territory, which reached eaſtward from Vico Vecchio, and weſtward to the promontory of Minerva, including likewiſe the iſland of Caprea, and the two iſlands of the Galli. Towards the N. it comprehends the cities of Lettere, Gragnaus, Pimontio, and Capule di Franchi ; towards the S. thoſe of Scala, Ravelli, Minori, Majori, Atrani, Tramonti, Agerula, Citara, Prajano, and Roſilano. Leo. IV. found the Amalfitans uſeful allies in his wars with the infidels, and honoured the commonwealth with the title, afterwards conferred on the kings of England, of *Defender of the Faith*. The Neapolitans, with whom, as Greek vaſſals, they were united in ſtrict bonds of friendſhip, experienced many ſignal favours from them ; and the Muſſulmans themſelves found it expedient to court their alliance, and to enter into a treaty with them. Their ſituation had from the beginning given them a turn to commerce, and their attention to naval affairs ſo much conſequence in the eyes of their protector, the emperor of Conſtantinople, that by his orders a court was eſtabliſhed at Amalfi for the deciſion of all controverſies ariſing in maritime tranſactions. Its code and reports became the general rule in thoſe caſes throughout Europe ; its precedents and dacrees were allowed to be good authority to found judgment upon even in foreign tribunals.—To crown the mercantile and naval glory of the republic, it was reſerved to the lot of an Amalfitan to make, or at leaſt to perfect, the moſt important diſcovery ever made for the improvement of navigation.—Paſitano, a village which ſtands on the ſhore a few miles weſt of Amalfi, boaſt of having given birth to Flavius Gioia, or, as others call him, Flavius Bembo, the inventor of the mariner's compaſs. The Amalfitan merchants long engroſſed the trade of the Levant, and tranſacted the commercial buſineſs of the world in a lucrative and excluſive manner. The Piſans, Venetians, and Genoeſe, roſe upon their ruin ; and after monopolizing the emoluments of trade for ſome ages, made way for the more comprehenſive and daring ſpirit of the preſent maritime powers. At preſent Amalfi is ſubject to Naples, and is the ſee of an archbiſhop. It is but a ſhadow of what it was in its flouriſhing ſtate, when it extended over the ſtupendous rocks that hang on each ſide, ſtill crowned with remains of battlements, fortified walls, and ruined towers. Its buildings, Mr. Swinburne ſays, are not remarkable for elegance or ſize ; and contain at moſt 4000 inhabitants, who ſeem to be in a poor line of life. Long. 90. 20. E. Lat. 40. 35. N.

AMALGAM, or AMALGAMA, *n. s.* the mixture of metals procured by amalgamation.

AMALGAM, in chemiſtry, mercury united with a metal. The amalgam of mercury with lead, is a ſoft, friable ſubſtance, of a ſilver colour. By waſhing and grinding this amalgam with warm water in a glaſs mortar, the impurities of the metal will mix with the water; and by changing the water, and repeating the lotion again and again, the metal will be farther and farther purified. Boerhaave mentions it as one of the greateſt ſcrets in chemiſtry, to bring off the liquor, as clear as when firſt poured on the amalgam; which, he ſays, might afford a method of making the nobler metals, or procuring them from the baſer metals. This philoſophical way of purifying metals, may be eaſily applyed to all metals, except iron and copper. The amalgams of gold, ſilver, tin, lead, zinc, biſmuth, and copper, with quick-ſilver, are all white; and when the quantity of metal is large in proportion to that of the mercury, they thicken into a kind of paſte. All metals, except iron and copper, ſpontaneouſly unite and amalgamate with mercury; but gold with greateſt facility; ſilver the next; then lead and tin; copper and regulus of antimony, with difficulty; iron and cobalt, ſcarce at all; but with all other metals and ſemi-metals, mercury may eaſily be amalgamated.

To AMALGAMATE, *v. a.* to unite metals with quickſilver.

AMALGAMATION, *n. ſ.* the operation of making an amalgam or mixing mercury with any metal. For the combination of one metal with another, it is generally ſufficient that one of them be in a ſtate of fluidity. Mercury being always fluid, is, therefore, capable of amalgamation with other metals without heat; nevertheleſs heat conſiderably facilitates the operation. To amalgamate without heat requires nothing more than rubbing the two metals together in a mortar; but the metals to be united with the mercury ſhould be previouſly divided into very thin plates or grains. When heat is uſed, which is always almoſt effectual, and with ſome metals indiſpenſibly neceſſary, the mercury ſhould be heated till it begin to ſmoke, and the grains of metal made red hot, before they are thrown into it. If it be gold or ſilver, it is ſufficient to ſtir the fluid, with an iron rod for a little while, and then throw it into a veſſel filled with water. This amalgam is uſed for gilding or ſilvering on copper, which is afterwards expoſed to a degree of heat ſufficient to evaporate the mercury. Amalgamation with lead or tin is effected by pouring an equal height of mercury into either of theſe metals in a ſtate of fuſion, and ſtirring with an iron rod. Copper amalgamates with great difficulty, and iron not at all.

AMARANTH, *n. ſ.* the name of a plant. The flowers have no petals; the cup of the flower is dry and multified; the ſeeds are included in membranaceous veſſels, which, when come to maturity, burſt open tranſverſely or horizontally, like purſlane, each of which contains one or more roundiſh ſeeds. Among the many ſpecies, the moſt beautiful are, 1. The tree *amaranth*. 2. The long pendulous *amaranth*, with reddiſh coloured ſeeds, commonly called *Love lies a bleeding*. 3. In poetry, it is ſometimes an imaginary flower, ſuppoſed never to fade.

AMARANTHINE, *adj.* relating to amaranths; conſiſting of amaranths.

AMARANTHUS, AMARANTH, or FLOWER-GENTLE: A genus of the pentandria order, belonging to the monœcia claſs of plants; and, in the natural method, ranking under the 54th order, Miſcellaneæ. The characters are: The male calyx is a five or three leaved perianthium, erect, coloured, and perſiſtent: There is no corolla: The ſtamina conſiſt of five or three erect capillary filaments, the length of the calyx; the antheræ are oblong and verſatile: The female calyx the ſame as the male, and no corolla: The piſtilum has an ovate germen; the ſtyli are three, ſhort, and ſubulated; the ſtamina ſimple and perſiſtent: The pericarpium is an ovate capſule, three beaked, unilocular, and cut round: The ſeed is one, globular, compreſſed, and large. Of this genus Linnæus enumerates 19 ſpecies; the moſt remarkable of which are the following:

1. AMARANTHUS BICOLOR, MELANCHOLICUS, or two coloured amaranthus. This greatly reſembles the Tricolor, in its manner of growth; but its leaves have only two colours, which are an obſcure purple, and a bright crimſon. Theſe are ſo blended, as to ſet off each other, and, when the plants are vigorous, make a fine appearance.

2. AMARANTHUS CAUDATUS, with very long hanging cyrindrical ſpikes. This ſpecies is a native of America. It has an upright ſtem, three feet high; the leaves and ſtalks are of a pale green. The ſpikes of flowers are produced from the wings of the ſtalks, and at the extremities of the branches. They are of a bright purple colour, and hang downward, ſometimes to the length of two feet and an half, ſo that many of them touch the ground.

3. AMARANTHUS MAXIMUS, or tree-like amaranthus, grows with a ſtrong ſtem, to the height of ſeven or eight feet. Towards the top it ſends forth many horizontal branches, garniſhed with oblong rough green leaves. At the extremity of every ſhoot, the cylindrical ſpikes of flowers are produced. They are of a purple colour, and hang downwards like the laſt, but are ſeldom half the length, though much thicker than the former.

4. AMARANTHUS OLERACEUS, with obtuſe indented leaves. This has no beauty; but it is uſed by the Indians as a ſubſtitute for cabbage.

5. AMARANTHUS SANGUINEUS, with compound ſpikes, and oblong oval leaves, a native of the Bahama iſlands, is an eſculent plant, and bears fine flowers. It grows to the height of three feet, with purple ſtalks and leaves. The ſpikes are ſhort and cylindrical, of a bright purple at firſt, but afterwards of a darker colour. They are frequently produced from the wings of the ſtalks; but at the extremity of the ſtalk ariſes a large cluſter of ſpikes, which are placed croſswiſe, with one upright ſtalk in the middle.

6. AMARANTHUS TRICOLOR, or three coloured amaranthus. This has been long cultivated in gardens, on account of the beauty of its variegated leaves, which are green, yellow, and red; very elegantly mixed. When the plants are in full vigour, the leaves are large, and cloſely ſet from the bottom to the top of ſtalks, and the branches form a ſort of pyramid; ſo that there is not a more beautiful plant than this when it is in full luſtre. This ſpecies, as well as the firſt, being delicate, requires ſome air and care to bring them to perfection. Thoſe who wiſh to have theſe annual plants in great perfection, ſhould get a glaſs caſe erected, with upright and ſloping glaſſes on every ſide, with a pit in the bottom for tan, in which the pots ſhould be plunged. If this is raiſed eight or nine feet to the ridge, and

by the perſon of any ambaſſador or other public miniſter, or any of his domeſtics or domeſtic ſervants may be arreſted or impriſoned, or his or their goods or chattles be diſtrained, ſeized or attached, ſuch writ and proceſs is null and void; and the perſon or perſons, who ſhall ſue forth or proſecute any ſuch writ or proceſs, together with all attornies, ſolicitors and officers concerned therein are deemed violators of the law of nations, and may be impriſoned not exceeding three years, and fined at the diſcretion of the court; but any citizen or inhabitant of the United States, who ſhall have contracted debts prior to his entering into the ſervice of any ambaſſador, or other public miniſter, which debts ſhall ſtill remain unpaid, is not entitled to ſuch privileges. See Laws U. S. 2d Seſſ. 1ſt Cong. chap. ix. But ambaſſadors cannot be defended, when they commit any crime againſt that ſtate, or the perſon of the prince, with whom they reſide; and if they are guilty of treaſon, felony, &c. or any other crime againſt the law of nations, they loſe the privilege of an ambaſſador, and may be ſubject to puniſhment as private aliens.

AMBASSADRESS, *n. s.* 1. The lady of an ambaſſador.—2. In ludicrous language, a woman ſent on a meſſage.

AMBASSAGE, *n. s.* an embaſſy; the buſineſs of an ambaſſador.

AMBER, *adj.* conſiſting of amber.

Amber, *n. s.* a yellow tranſparent ſubſtance of a gummous or bituminous conſiſtence, but a reſinous taſte, and ſmell like oil of turpentine; chiefly found in the Baltic ſea, along the coaſts of Pruſſia. Some naturaliſts refer it to the vegetable, others to the mineral, and ſome even to the animal kingdom. Pliny deſcribes it as a reſinous juice, oozing from aged pines and firs, and diſcharged thence into the ſea. He adds, that it was hence the ancients gave it the denomination of *ſuccinum*, from *ſuccus*, juice. Some have imagined it a concretion of the tears of birds; others the urine of a beaſt; others, the ſcum of the lake Cephiſis, near the Atlantic; others, a congelation formed in the Baltic, and in ſome fountains, where it is found ſwimming like pitch. Others ſuppoſe it a bitumen trickling into the ſea from ſubterraneous ſources; but this opinion is alſo diſcarded, as good *amber* having been found in digging at a conſiderable diſtance from the ſea, as that gathered on the coaſt. Boerhaave ranks it with camphire, which is a concrete oil of aromatic plants, elaborated by heat into a cryſtaline form.

Amber, among naturaliſts, is farther defined to be a ſolid, hard, ſemipellucid, bituminous ſubſtance of a particular nature, of uſe in medicine and in ſeveral of the arts. It has been called *ambra* by the Arabians, and *electrum* by the Greeks. It has been of great repute in the world from the earlieſt times. Many years before Chriſt it was in eſteem as a medicine; and Plato, Ariſtotle, Herodotus, Æſchylus, and others, have commended its virtues. Theophraſtus wrote expreſsly upon the ſubject, about A. A. C. 300. In the times of the Romans it became in high eſteem as a gem; and in the luxurious reign of Nero, immenſe quantities were brought to Rome, and uſed for ornamenting works of various kinds. The moſt remarkable quality of this ſubſtance is, that, when rubbed, it attracts other bodies; and this, it is obſerved, it does, even to thoſe ſubſtances which the ancients thought it had an antipathy to; as oily bodies, drops of water, human ſweat, &c. The property which amber poſſeſſes of attracting light bodies, was very anciently obſerved. From *Elcktron*, the Greek name for amber, is derived the term *Electricity*, which is now very extenſively applied not only to the power of attracting light bodies inherent in amber, but to other ſimilar powers, and their various effects, in whatever bodies they reſide, or to whatever bodies they may be communicated. See Electricity. Inſects are ſometimes found in amber, and this phænomena can only be accounted for from their being attracted by its flavour; for thoſe inſects are never found in the centre of the pieces of amber, but always near the ſurface. It is obſerved by the inhabitants of thoſe places where amber is produced, that all animals, whether terreſtrial, ærial, or aquatic, are extremely fond of it, and that pieces of it are frequently found in their excrements. The bodies of inſects, found buried in amber, have been long admired; but of the moſt remarkable of theſe, many are to be ſuſpected as counterfeit, the great price at which beautiful ſpecimens of this kind ſell, having tempted ingenious cheats to introduce animal bodies in ſuch artful manners into ſeemingly whoſe pieces of amber, that it is not eaſy to detect the fraud. Of thoſe inſects which have been originally incloſed in amber, ſome are plainly ſeen to have ſtruggled hard for their liberty, and even to have left their limbs behind them in the attempt; it being no unuſual thing to ſee, in a maſs of amber that contains a ſtout beetle, the animal wanting one, or perhaps two of its legs; and thoſe legs left in different places, nearer that part of the maſs from which it has travelled. This alſo may account for the common accident of finding legs, or wings of flies, without the reſt of their bodies, in pieces of amber; the inſects having, when entangled in the yet ſoft and viſcid matter, eſcaped, at the expence of leaving thoſe limbs behind them. Beautiful leaves of a pinnated ſtructure, reſembling ſome of the ferns, or maidenhairs, have been found in ſome pieces; but theſe are rare, and the ſpecimens of great value. Naturaliſts have been greatly divided as to the origin of this ſubſtance, and what claſs of bodies it belongs to. Some ſuppoſe amber a compound ſubſtance. Pruſſia, ſay they, and the other countries which produce amber, are moiſtened with a bituminous juice, which mixing with the vitriolic ſalts abounding in thoſe places, the points of thoſe ſalts fix its fluidity, whence it congeals; and the reſult of that congelation makes what we call amber; which is more or leſs pure, tranſparent, and firm, as thoſe parts of ſalt and bitumen are more or leſs pure, and are mixed in this or that proportion. Upon the whole, it ſeems generally agreed upon, that amber is a true bitumen of foſſile origin.—In a late volume of the *Journal de Phyſique*, however, we find it aſſerted by Dr. Girtanner to be an animal production, a ſort of honey or wax formed by a ſpecies of large ant called by Linnæus *formica rufa.* Theſe ants, he ſays, inhabit the old-pine foreſts, where they ſometimes form hills about ſix feet in diameter; and it is generally in theſe ancient foreſts, or in places where they have been, that foſſil amber is found. This ſubſtance is not ſo hard as that which is taken up in the ſea at Pruſſia, and which is well known to naturaliſts. It has the conſiſtence of honey or of half melted wax, but it is of a yellow colour like common amber; it

AMAZEDLY, *adv.* confuſedly; with amazement; with confuſion.

AMAZEMENT, *n. s.* 1. Such a confuſed apprehenſion as does not leave reaſon its full force; extreme fear; horror.—2. Extreme dejection.—3. Height of admiration.—4. Aſtoniſhment; wonder at an unexpected event.

AMAZING, *participal adj.* wonderful; aſtoniſhing.

AMAZINGLY, *adv.* To a degree that may excite aſtoniſhment; wonderfully.

AMAZON, *n. s.* a warlike woman; a virago.—The Amazons were a race of women famous for their valour, who inhabited Caucaſus; they are ſo called from their cutting off their breaſts, to uſe their weapons better.

Amazon, Amazons, or **Orellana**, is generally eſteemed the largeſt river in the world. It is formed by two large rivers, the one riſing in the province of Quito, a little S. of the equator, in 2 degrees of E. Lon. and the other named Xauxa, riſing in the lake of Bourbon, near the Andes, in S. Lat. Theſe two rivers uniting on the confines of Peru and Amazonia, in S. Lat. aſſume the name of Amazon; whence running E. upwards of 200 miles, and afterwards inclining to the N. they fall into the Atlantic ocean by 84 channels, which in the rainy ſeaſon overflow the adjacent country. Beſides theſe two rivers, about 200 others; from each ſide, contribute to encreaſe the flood of this extraordinary river. As it runs almoſt acroſs the broadeſt part of South America, it is computed to be between 4000 and 5000 miles in length, reckoning all its windings. Its channel from Junta de los Reyos, about 60° from its head to the river Maranhon, is from one to two leagues broad; it then widens from three to four, and becomes gradually broader as it approaches the ocean. At its mouth, it is ſaid to be about 150 miles broad! During its courſe it forms many iſlands. Its depth, between the places laſt mentioned, is from five to 10 fathoms, but from Maranhon to Rio Negro it encreaſes to 20 fathoms; after which it is ſometimes 30, and ſometimes 50, or more, till it comes near the end of its courſe. It has no ſand banks, nor does the ſhore ſhelve ſo as to render it dangerous for veſſels. The manetu and tortoiſe abound both upon the banks of this and the other rivers; and the fiſhermen muſt be upon their guard againſt the crocodiles, alligators, and water ſerpents, which alſo ſwarm here. This river pours its waters into the ocean with ſuch force, as to repel the briny waves to the diſtance of many leagues from the land. See next article.

AMAZONIA, an extenſive and fertile country of South America about 1400 miles in length, and 900 in breadth, bounded on the North by Terra Firma and Guiana, on the E. by the Atlantic ocean and Brazil, on the S. by Paraguay, and on the W. by Peru. It may be ſaid to extend from 4. 50. N. to 19. 20. S. Lat. and from 5 to 25 E. Lon. from Philadelphia. Many fabulous ſtories have been related of this country being inhabited, by a race of warlike women, who were governed by a queen, ſimilar to the ancient ſtories of ſuch a nation inhabiting a diſtrict of country on the borders of the Black Sea. The Spaniards, when they firſt invaded the country, received theſe romantic fictions from ſome Indians, who repreſented theſe heroines as extremely expert, brave and formidable in war, and, having themſelves met with ſome women on the confines of Amazonia, who were remarkably intrepid and daring, as well a ſkilful in the uſe of weapons of war, the relation was tranſmitted until it became received as a fact. M. de Condamine, however, who afterwards travelled into theſe parts, to meaſure a degree of the meridian, made the fulleſt reſearches into this relation, and obtained the moſt ſatisfactory proof, that it had no foundation in truth. The ſoil of this country is very rich and fertile, the trees and plants being in verdure all the year round; but the rivers and lakes are greatly infeſted by crocodiles, alligators, and water-ſerpents. Their banks are inhabited by different tribes of Indians, governed by petty ſovereigns, diſtinguiſhed from their ſubjects by coronets of beautiful feathers. The Spaniards have made many attempts to ſettle this country; but difficulties and diſaſters have hitherto rendered their deſigns abortive. On that part of the coaſt, between Cape North and the mouth of the Amazon, the Portugueſe have ſome ſettlements.

AMAZONIAN, ſomething relating to, or reſembling Amazons.

AMAZONS, in antiquity, a nation of female warriors, who are ſaid to have founded an empire in Aſia Minor, upon the river Thermodoon, along the coaſts of the Black Sea; and to have formed a ſtate from which men were excluded. What commerce they had with that ſex was only with ſtrangers; they killed all their male children, and they cut off the right breaſts of their female ones, to make them more fit for the combat. From which laſt circumſtance it is, that they are ſuppoſed to take their name, viz. from the Greek words *a*, and *mazos*, which ſignify without breaſts. But Dr. Bryant, in his analyſis of ancient Mythology, explodes this account as fabulous; and obſerves, that they were in general Cuthite colonies from Egypt and Syria, who formed ſettlements in different countries, and that they derived their name from *zon*, the ſun, which was the national object of worſhip.—It has indeed been controverted even among ancient writers, whether there really ever were ſuch a nation as that of the Amazons. Strabo, Palæphatus, and others, deny it. On the contrary, Herodotus, Pauſanius, Diodorus Siculus, Trogus Pompeius, Juſtin, Pliny, Mela, Plutarch, &c. expreſsly aſſert it.

AMBAGES, *n. s.* a circuit of words; a circumlocutory form of ſpeech; a multiplicity of words; an indirect manner of expreſſion.

AMBAGIOUS, *adj.* circumlocutory; perplexed; tedious.

AMBASSADOR, or **Embassador**, *n. s.* a perſon ſent, in a public manner, from one ſovereign power to another, to repreſent the government of that country by which he has been diſpatched. Ambaſſadors are either ordinary or extraordinary. Ambaſſador *in ordinary* is he, who conſtantly reſides in the court of another prince, to maintain a good underſtanding, and looks to the intereſt of his maſter. Till about two hundred years ago, Ambaſſadors in ordinary were not heard of: all till then were ambaſſadors *extraordinary*; that is, ſuch as are ſent on ſome particular occaſion, and who retire as ſoon as the affair is diſpatched. By the laws of every civilized nation, ambaſſadors are entitled to very extenſive privileges, particularly an exemption of their perſons and property from arreſt by civil proceſs. If any writ or proceſs ſhall be iſſued from any court either of the United States or of any of the individual ſtates, wherein the whale, he conſtantly found a conſiderable quantity of black ſpots, which after the moſt careful examination, appeared to be the beaks of the *Sepia Octopodia*; and theſe beaks, he thinks, might be the ſubſtances which have hitherto been always miſtaken for claws or beaks of birds, or for ſhells. The preſence of theſe beaks in ambergriſe proves evidently, that all ambergriſe containing them is in its origin, or muſt have been once, of a very ſoft or liquid nature, as otherwiſe thoſe beaks could not ſo conſtantly be intermixed with it throughout its whole ſubſtance. That ambergriſe is found either upon the ſea and ſea coaſt, or in the bowels of whales, is a matter of fact univerſally credited. But it has never been examinad into and determed, whether the ambergriſe found upon the ſea and ſea-coaſts is the ſame as that found in the whale, or whether they are different from one another? Whether that found on the ſea or ſea-coaſts has ſome properties, or conſtituent parts, which that found in the whale has not? And laſtly, whether that found in the whale is ſuperior or inferior in its qualities and value to the former? It is likewiſe a matter of conſequence to know, whether ambergriſe is found in all kinds of whales, or only in a particular ſpecies of them? Whether it is conſtantly and always to be met with in thoſe animals? And, if ſo, in what part of their body it is to be found? All theſe queſtions we find very ſatisfactorily diſcuſſed by Dr. Swediaur. According to the beſt information that he could obtain from ſeveral of the moſt intelligent perſons employed in the ſpermaceti whale fiſhery, and in procuring and ſelling ambergriſe, it appears, that this ſubſtance is ſometimes found in the belly of the whale, but in that particular ſpecies only which is called the *ſpermaceti whale*, and which, from its deſcription and delineation, appears to be the *Phyeſter Macrocephalus* of Linnæus.

Ambergriſe, method of procuring. The New-England fiſhermen, have long known that ambergriſe is to be found in the ſpermaceti whale; and they are ſo convinced of this fact, that whenever they hear of a place where ambergriſe is found, then always conclude that the ſeas in that part are frequented by this ſpecies of whale. The perſons who are employed in the ſpermaceti whale fiſhery, confine their views to the Phyſeter macrocephalus. They look for ambergriſe in all the ſpermaceti whales they catch, but it ſeldom happens that they find any. Whenever they hook a ſpermaceti whale, they obſerve, that it conſtantly not only vomits up whatever it has in its ſtomach, but alſo generally diſcharges its fæces at the ſame time; and if this latter circumſtance takes place, they are generally diſappointed in finding ambergriſe in its belly. But whenever they diſcover a ſpermaceti whale, male or female, which ſeems torpid and ſickly, they are always pretty ſure to find ambergriſe, as the whale in this ſtate ſeldom voids its fæces upon being hooked. They likewiſe generally meet with it in the dead ſpermaceti whales, which they ſometimes find floating on the ſea. It is obſerved alſo, that the whale, in which they find ambergriſe, often has a morbid protuberance; or, as they expreſs it, a kind of gathering in the lower part of its belly, in which if cut open, ambergriſe is found. It is obſerved, that all thoſe whales, in whoſe bowels ambergriſe is found, ſeem not only torpid and ſick, but are alſo conſtantly leaner than others; ſo that, if we may judge from the conſtant union of theſe two circumſtances, it would ſeem that a larger collection of ambergriſe in the belly of the whale is a ſource of diſeaſe, and probably ſometimes the cauſe of its death. As ſoon as they hook a whale of this deſcription, torpid, ſickly, emaciated, or one that does not dung on being hooked, they immediately either cut up the above-mentioned protuberance, if there be any, or they rip open its bowels from the orifice of the anus, and find the ambergriſe, ſometimes in one, ſometimes in different lumps, of generally from 3 to 12 and more inches in diameter, and from one pound to 20 or 30 pounds in weight, at the diſtance of two, but moſt frequently of about 6 or 7 feet from the anus, and never higher up in the inteſtinal canal; which, according to their deſcription, is, in all probability, the inteſtinum cæcum, hitherto miſtaken for a peculiar bag made by nature for the ſecretion and collection of this ſingular ſubſtance. That the part they cut open to come at the ambergriſe is no other than the inteſtinal canal is certain, becauſe they conſtantly begin their inciſion at the anus, and find the cavity every where filled with the fæces of the whale, which from their colour and ſmell it is impoſſible for them to miſtake. The ambergriſe found in the inteſtinal canal is not ſo hard as that which is found on the ſea or ſea-coaſt, but ſoon grows hard in the air: when firſt taken out it has nearly the ſame colour, and the ſame diſagreeable ſmell, though not ſo ſtrong, as the more liquid dung of the whale has; but, on expoſing it to the air, it by degrees not only grows greyiſh, and its ſurface is covered with a greyiſh duſt like old chocolate, but it alſo loſes its diſagreeable ſmell, and, when kept for a certain length of time, acquires the peculiar odour which is ſo agreeable to moſt people. The gentlemen Dr. Swediaur converſed with confeſſed, that if they knew not from experience that ambergriſe thus found will in time acquire the above-mentioned qualities, they would by no means be able to diſtinguiſh ambergriſe from hard indurated fæces. This is ſo true, that whenever a whale voids its fæces upon being hooked, they look carefully to ſee if they cannot diſcover among the more liquid elements (of which the whale diſcharges ſeveral barrels) ſome pieces floating on the ſea, of a more compact ſubſtance than the reſt; theſe they take up and waſh, knowing them to be ambergriſe. In conſidering whether there be any material difference between ambergriſe found upon the ſea or ſea-coaſt, and that found in the bowels or among the dung of the whale, Dr. Swediaur refutes the opinion, that all ambergriſe found in whales is of an inferior quality, and therefore much leſs in price. Ambergriſe, he obſerves, is only valued for purity, lightneſs, compactneſs, colour, and ſmell. There are pieces of ambergriſe found on different coaſts, which are of a very inferior quality; whereas there are often found in whales pieces of it of the firſt value; nay, ſeveral pieces found in the ſame whale, according to the above-mentioned qualities, are more or leſs valuable. All ambergriſe found in whales has at firſt when taken out of the inteſtines very near the ſame ſmell as the liquid excrements of that animal have; it has then alſo nearly the ſame blackiſh colour: they find it in the whale ſometimes quite hard, ſometimes rather ſoftiſh, but never ſo liquid as the natural fæces of that animal. And it is a matter of fact, that, after being taken out and kept in the air, all ambergriſe grows not only harder and whiter, but alſo loſes by degrees its ſmell, and aſſumes ſuch an agreeable one, as that in general has which is found ſwimming upon the ſea; therefore the goodneſs of ambergriſe ſeems rather to depend on its age. By being accumulated after a certain length of time in the inteſtinal canal, it ſeems even then to become of a whiter colour, and leſs ponderous, and to acquire its agreeable ſmell. The only reaſon why ambergriſe found floating on the ſea generally poſſeſſes the above-mentioned qualities in a ſuperior degree, is becauſe it is commonly older, and has been longer expoſed to the air. It is more frequently found in males than in females; the pieces found in females are in general ſmaller, and thoſe found in males ſeem conſtantly to be larger and of a better quality; and therefore the high price in proportion to the ſize is not merely imaginary for the rarity ſake, but in ſome reſpect well founded, becauſe ſuch large pieces appear to be of a greater age, and poſſeſs the above-mentioned qualities, in general, in a higher degree of perfection, than ſmaller pieces. It is known, that the Sepia octopodia, or cuttle-fiſh, is the conſtant and natural food of the ſpermaceti whale, or Phyſeter macrocephalus. Of this the fiſhers are ſo well perſuaded, that whenever they diſcover any recent relics of it ſwimming on the ſea, they conclude that a whale of this kind is, or has been, in that part. Another circumſtance which corroborates the fact is, that the ſpermaceti whale on being hooked generally vomits up ſome remains of the Sepia. Hence it is eaſy to account for the beaks, or pieces of beaks, of the Sepia found in all ambergriſe. The beak of the Sepia is a black horny ſubſtance, and therefore paſſes undigeſted through the ſtomach into the inteſtinal canal, where it is mixed with the fæces; after which it is either evacuated with them, or if theſe latter be preternaturally retained, forms concretions with them, which render the animal ſick and torpid, and produce an obſtipation, which ends either in an abſceſs of the abdomen, as has been frequently obſerved, or becomes fatal to the animal; whence in both caſes, on the burſting of its belly, that hardened ſubſtance, known under the name of *ambergriſe*, is found ſwimming on the ſea, or thrown upon the coaſt. From the preceding account, and his having conſtantly found the above-mentioned beaks of the Sepia in all pieces of any conſiderable ſize, Dr. Swediaur concludes with great probability, that all ambergriſe is generated in the bowels of the Phyſeter macrocephalus, or ſpermaceti whale; and there mixed with the beaks of the Sepia octopodia, which is the principal food of that whale. He therefore defines ambergriſe to be the preternaturally hardened dung or fæces of the Phyſeter macrocephalus, mixed with ſome indigeſtible relics of its food.

Ambergriſe, uſes of, &c. The uſe of ambergriſe is now nearly confined to perfumery, though it has formerly been recommended in medicine by ſeveral eminent phyſician. Hence the Eſſentia Ambræ Hoffmanni, Tinctura Regia Cod. Pariſini, Trochiſci de Ambra Phi. Wurtemberg, &c. If we wiſh to ſee any medical effects from this ſubſtance Dr. Swediaur obſerves, we muſt certainly not expect them from two or three grains, but give rather as many ſcruples of it for a doſe; though even then, he thinks, there would be no reaſon to expect much effect from it, as he had himſelf taken of pure unadulterated ambergriſe in powder, 30 grains at once, without obſerving the leaſt ſenſible effect from it. A ſailor, however, who had the curioſity to try the effect of recent ambergriſe upon himſelf, took half an ounce of it melted upon the fire, and found it a good purgative; which proves that it is not quite an inert ſubſtance. In Aſia and part of Africa, ambergriſe is not only uſed as a medicine and as a perfume; but conſiderable uſe is alſo made of it in cookery, by adding it to ſeveral diſhes as a ſpice. We have various inſtances in creditable authors of vaſt maſſes of this ſubſtance being found on different occaſions. One of the largeſt that has been known in Europe, was bought by the Dutch India Company from the king of Tydor, and kept in their warehouſe for ſome years. It was almoſt round, meaſured two feet in diameter, and weighed 182 pounds. The grand duke of Tuſcany offered 50,000 crowns for it. Another piece was taken up at the Cape of Good Hope, which weighed 300 pounds, and another is mentioned in the Philoſophical Tranſactions, No. 232, which is ſaid to have weighed no leſs than 15,000 ponnds!

AMBER, oil of, a fine tranſparent ponderous yellow oil, procured from amber, by increaſing the heat after the ſpirit is obtained. It is reckoned a good anti-hyſteric and emmenagogue.

Amber, spirit of, an acid liquor, procured from amber, by pulveriſing and diſtilling it with a ſand heat. It is chiefly uſed in rheumatic pains externally, and in inveterate gleets internally.

Amber tree, in botany. See Anthospermum.

Amber, Volatile Salt of, is the principal chemical production of Amber. It is a peculiar acid ſalt, which riſes after the oil, and fixes in the neck of the retort. Mr. Potts concludes from various experiments, that the acid of this ſalt is eſſentially different from the three mineral acids, and approaches neareſt to thoſe of the vegetable kingdom. It is a good cephalic and detergent; and Quincy ſays, it attenuates, cuts and penetrates, the moſt remote and minute receſſes; and thus ſcours, as it were, the whole nervous ſyſtem. Its chief tendency, he adds, is to ſecretion, and what it carries off, is by urine. It alſo contributes to promote a diaphoreſis, and is preſcribed in chronic caſes, as palſies, epilepſies. It is often adulterated with ſal-ammoniac, nitre, cream of tartar, &c.

AMBIDEXTER, *n. s.* a man who has equally the uſe of both his hands; but this word may be rather more explicitly defined, a perſon who can uſe both hands with the ſame facility and for the ſame purpoſes, that the generality of people do their right hands. As to the natural cauſe of this faculty, ſome, as Hœfer, attributes it to an extraordinary ſupply of blood and ſpirits from the heart and brain, which furniſh both hands with the neceſſary ſtrength and agility; others, as Nicholas Maſſa, to an erect ſituation of the heart, inclining neither to the right hand nor left; and others to the right and left ſubclavian arteries being of the ſame height and the ſame diſtance from the heart, by which the blood is propelled with equal force to both hands. But theſe are only conjectures, or rather chimeras. Others, with more reaſon, think, that, were it not for education and habit, all mankind would be ambidexters; and, in fact, we frequently find nurſes to be at a good deal of pains before they can bring children to forego the uſe of their left hands. How far it may be an advantage to be deprived of half our natural dexterity, may be doubted. It is certain, there are infinite occaſions in life, when it would be better to have the equal uſe of both hands. Surgeons and occuliſts are of neceſſity obliged to be ambidexters; bleeding, &c. in the left arm or left ancle, and operations on the left eye, can not be well performed but with the left hand.

AMBIDEXTERITY, *n. s.* 1. The quality of being able equally to uſe both hands.—2. Double dealing.—Various inſtances occur in hiſtory, where the left hand has been exerciſed preferably to the right. By the laws of the ancient Scythians, people were enjoined to exerciſe both hands alike; and Plato enjoins ambidexterity to be obſerved and encouraged in his republic. In the Grecian armies, the more diſtinguiſhed ſoldiers, their pikemen, and halberdeers, as well as thoſe who formed the firſt line of the battalions, were trained to be able to fight equally with the left hand or right. We find it mentioned in ſcripture, too, that on an extraordinary occaſion, the ſingle tribe of Gad produced 700 brave men, who fought with the left hand as well as the right; and the Roman hiſtorians aſſure us, that they had gladiators who were trained up to the ſame exerciſe. An ingenious French writer is ſurpriſed, that among all the modern refinements in the art of war, none have thought of reſtoring the ancient practice of training ambidexters, who undoubtedly might be of great ſervice, eſpecially in caſes of ſtratagem.

AMBIDEXTROUS, *adj.* having, with equal facility, the uſe of either hand.

AMBIENT, *adj.* ſurrounding; encompaſſing; inveſting.

AMBIGU, *n. s.* an entertainment, conſiſting not of regular courſes, but of a medley of diſhes ſet on together.

AMBIGUITY, *n. s.* doubtfulneſs of meaning; uncertainty of ſignification; double meaning.

AMBIGUOUS, *adj.* doubtful; having two meanings; of uncertain ſignification.

AMBIGUOUSLY, *adv.* in an ambiguous manner; doubtfully; uncertainly; with double meaning.

AMBILOGY, *n. s.* talk of ambiguous or doubtful ſignification.

AMBILOQUOUS, *adj.* uſing ambiguous and doubtful expreſſions.

AMBIT, *n. s.* the compaſs or circuit of any thing; the line that encompaſſes any thing.

AMBITION, *n. s.* 1. The deſire of preferment or honor.—2. The deſire of any thing great or excellent. Ambition is generally uſed in a bad ſenſe, for an immoderate or illegal purſuit of power or honour. In the latter, and perhaps original meaning, however, of the word, it ſignifies the ſame with the ambitus of the Romans. Ambition in the former and more general ſenſe, is a paſſion that can never be ſatisfied. [illegible] however, convey a ſufficient [illegible] ambition, conſidered as a *common paſſion* of the human mind. Few are born to rank or power, and though many deſire them, yet, to many others they would be a burden. Yet no perſon, we believe, is totally deſtitute of ambition. Dr. Young has juſtly ſtiled ambition, or the love of fame, an univerſal paſſion. In this enlarged view, we would define ambition to be—A *deſire of excelling*, or at leaſt of being thought to excel, *our neighbours* in any thing. This definition, we apprehend, will apply to ambition in every point of view, whether its objects are good or bad, laudable or the contrary.

AMBITIOUS, *adj.* ſeized or touched with ambition; deſirous of advancement; eager of honours; aſpiring.

AMBITIOUSLY, *adv.* in an ambitious manner; with eagerneſs of advancement or preference.

AMBLE, *n. s.* a pace or movement in which the horſe removes both his legs on one ſide; as, on the far ſide, he removes his fore and hinder leg of the ſame ſide at one time, whilſt the legs on the near ſide ſtand ſtill, and when the far legs are upon the ground, the near ſide removes its fore leg and hinder leg, and the legs on the far ſide ſtand ſtill.

To AMBLE, *v. n.* 1. To move upon an amble.—2. To move eaſily, without hard ſhocks, or ſhaking.—3. In a ludicrous ſenſe, to move with ſubmiſſion, or by direction; as, a horſe that *ambles*, uſes a gait not natural.—4. To walk daintily and affectedly.

AMBLINGLY, *adv.* with an ambling movement.

AMBOY or PERTH AMBOY, a city and port of New Jerſey, which takes its name from [illegible], earl of *Perth*, and *Ambo*, a word, which in the Indian language, ſignifies *point*. It is pleaſantly ſituated [illegible] ty, at the head of Raritan Bay, [illegible] is formed by the union of Raritan river and Arthur-Kull Sound. It lies open to Sandy-Hook, and is one of the beſt harbours on the continent. [illegible] enter, in one tide, in all ſeaſons, [illegible]. It is a port of entry and poſt town, [illegible] ſuited for trade, and the legiſlature [illegible] encouragement to induce merchants [illegible] from being in a flouriſhing ſtate. It [illegible] with city privileges, and [illegible] the general aſſembly [illegible] event, it was the capital of Eaſt Jerſey, and the [illegible] and ſupreme court [illegible] alternately. It contains about [illegible] and [illegible] on a ſmall trade with the Weſt-Indies. It is [illegible] W. of New-York, and [illegible] Lat. 40. 29. N. Lon. [illegible]

AMBOYNA, one of the Molucca iſlands in the E. Indies. It lies in S. Lat. [illegible] is remarkable for being the [illegible] megs and cloves which [illegible] by the Britiſh [illegible] by the Dutch E. India company. [illegible] circumference. Beſides cloves, [illegible] of the tropical fruits and [illegible] ty of good water. [illegible] ever, proceeds more from [illegible] the [illegible] the ſoil; for exc[illegible] well as the Moluccas, induſtriouſly diſcouraged the cultivation of every eſculent commodity, with the view of withholding ſubſiſtence from thoſe who might be tempted to invade them. Of the natives, the men wear large whiſkers, but have little hair upon their chins; and have a ſlight ce of ſtuff wrapped round their middle. The women tie ir hair in knots; the maids are bought of their fathers ore they are married, and if the wife prove barren, the iage is diſſolved. Some of the natives are Mahome- s, and ſome Chriſtians, but thay are all repreſented as be- very deceitful and treacherous. Amboyna was con- ed in 1519 by the Portugueſe, who erected a fort up- it. They kept poſſeſſion of it till 1605, when they were riven out by the Dutch. The Engliſh who alſo had a re in the iſland, were likewiſe, expelled by them. The an of Amboyna receives an annual penſion from the utch Eaſt-India company, who have a guard of European ſoldiers here, maintained at their expence. The iſland is fended by a ſtrong fort, almoſt impregnable, which com- s the harbour. This iſland is frequently ſtyled the mine of the company; and the appellation ſeems to very appropriate, when it is conſidered that the cloves nutmegs, which they ſell in Europe at ſo extravagant a ce, does not coſt them a cent per pound.

AMBROSIA, *n. s.* 1. The imaginary food of the Gods. The name of a plant.

A ROSIA, in botany, a genus of the pentandria order, nging to the monœcia claſs of plants; and, in the na- thod, ranking under the 49th order, Compoſitæ-nu- ntaceæ. The characters are:—the male flowers are und: The common calyx is a ſingle leaved perian- the length of the florets: The compound corolla is tubular, flat, and hemiſpherical: the proper is mo- lous, funnel ſhaped, and quinqefid: The ſtamina con- five very ſmall filaments; the antheræ are erect, pa- and pointed: The piſtillum has a filiform ſtylus, the th of the ſtamina; The ſtigma orbicular and membra- : The receptaculum is naked.—Female flowers below le ones, on the ſame plant, doubled; the calyx is a eaved perianthum, entire (with the belly quinque- ed,) one flowered, and perſiſtent: There is no corolla: iſtillum has an ovate germen in the bottom of the ; a filiform ſtylus, the length of the calyx; and two briſtly ſtigmata; The pericarpium is an ovate uni- r nut: The ſeed is ſingle and roundiſh. Of this ge- ve ſpecies are enumerated; but having no properties hy of notice, we omit any farther account of them.

MBROSIAL, *adj.* partaking of the nature or qualities broſia; fragrant; delicious; delectable.

MBROSINIA, in botany, a genus of the Polyandria belonging to the gynandria claſs of plants; the cha- s of which are; The calyx is a ſingle leaved ſpatha, by a partition into two cells; There is no corolla: ina conſiſt of a ſingle filament in the interior cell; æ are numerous, with two roundiſh concave nec- their baſe: The piſtillum is in the interior cell; n roundiſh; the ſtylus cylindrical, and ſhorter e ſpatha; the ſtigma obtuſe: The pericarpium (a ,) roundiſh and unilocular. There is but one ſpe- ative of Turkey.

, *n. s.* 1. The place where the almoner lives, or where alms are diſtributed.—2. The place where plate and utenſils for houſekeeping, are kept.

AMBS ACE, *n. s.* a double ace.

AMBULATION, *n. s.* the act of walking.

AMBULATORY, *adj.* 1. That which has the power or faculty of walking.—2. That which happens during a paſſage or walk.—3. Moveable.

AMBURY, *n. s.* a bloody wart on any part of a horſe's body. The word Ambury, among farriers, denotes a tumour, wart, or ſwelling, which is ſoft to the touch, and full of blood. This diſorder of horſes is cured by tying a horſe hair very hard about its root; and, when it has fallen off, which commonly happens in about eight days, ſtrewing ſome powder of verdigris upon the part, to prevent the return of the complaint. If the tumour be ſo low that nothing can be tied about it, they cut it out with a knife, or elſe burn it off with a ſharp hot iron; and, in ſinewy parts, where a hot iron is improper, they eat it away with oil of vitriol, or white ſublimate. Some farriers boaſt of a ſecret, which infallibly cures all protuberances of this kind; the preparation of which is this: Take three ounces of green vitriol and one ounce of white arſenic; beat them to a coarſe powder, and put them into a crucible; place the crucible in the middle of a charcoal fire, ſtirring the ſubſtance, but carefully avoiding the poiſonous ſteams; when the whole grows reddiſh, take the crucible out of the fire, and, when cool, break it and take out the matter at the bottom; beat this to powder in a mortar, and add to four ounces of this powder five ounces of *album rhosis;* make the whole into an ointment, and let it be applied cold to warts; rubbing them with it every day. They will thus fall off gently and eaſily, without leaving any ſwellings. It is beſt to keep the horſe quiet, and without working, during the cure. What ſores remain on the parts from which the ſwellings fall off, may be cured with the common application called the counteſs's ointment.

AMBUSCADE, *n. s.* a private ſtation, in which men lie to ſurpriſe others; ambuſh.—This word in the military art, properly denotes a place where ſoldiers may lie concealed till they find an opportunity to ſurpriſe the enemy.

AMBUSH, *n. s.* 1. The poſt where ſoldiers or aſſaſſins are placed, in order to fall unexpectedly on the enemy.—2. The act of ſurpriſing another, by lying in wait, or lodging in a ſecret poſt.—3. The ſtate of lying in wait.—4. Perhaps the perſons placed in private ſtations.

AMBUSHED, *adj.* placed in ambuſh; lying in wait.

AMBUSTION, *n. s.* a burn; a ſcald.

AMEL, *n. s.* the matter with which the variegated works are overlaid, which we call *enamelled.*

AMELIA, a county of Virginia, bounded N. by Appamatox river, which ſeparates it from Powhattan and Cheſterfield counties, N. W. by Prince Edward, Eaſt by Dinwiddie, and S. by Nottoway, being 25 miles in length, and about 20 in breadth. Large quantities of black-lead are found here, but no works have as yet been erected. According to the cenſus of 1790, Amelia, including Nottoway, which has ſince that time been erected into a new county, contained 18,077 inhabitants, of whom 11,308 were ſlaves.

AMELLUS, STARWORT: a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants;

and in the natural method ranking under the 49th order, Compoſitæ-oppoſitifoliæ. The characters are: The common calyx is imbricated and roundiſh: The compound corolla is radiated; the hermaphrodite corollets numerous in the diſk; the female numerous in the ray: Proper corolla of the hermaphrodites are tubular and quinquefid; of the females, tongued, looſe, and two or three toothed: The ſtamina in the hermaphrodites conſiſt of five ſhort capillary filaments; the antheræ cylindric and tubular: The piſtillum has an ovate germen; a filiform ſtylus the length of the ſtamina; and two filiform ſtigmata: There is no pericarpium, but the calyx unchanged: The ſeeds are ovate and ſolitary; the pappus is hairy; the receptaculum chaffy.—Of this there are two ſpecies; viz.

1. Amellus lynchitis, with one flower on each footſtalk. This is a native of the Cape of Good Hope. It is a perennial plant, riſing about three feet high, ſending out many branches on each ſide, ſo as to form a buſhy plant; the branches are garniſhed with obtuſe ſpear-ſhaped leaves, placed oppoſite, and are terminated by ſingle naked flower-ſtalks, having a yellow diſk, which is ſucceeded by oblong ſeeds.—This ſpecies is eaſily propagated, either by cuttings planted in the ſummer months, or by ſeeds ſown on a moderate hot-bed in the ſpring, but the plants require a ſlight ſhelter in winter.

2. Amellus umbellatus, with flowers growing in umbels, is a native of Jamaica; and riſes from two to three feet high, ſending out many branches cloathed with oppoſite leaves, which are terminated by ſmall flowers in umbels.—This ſpecies is extremely tender, and therefore requires to be preſerved in a ſtove during the winter ſeaſon.

AMEN, *adv.* a term uſed in devotions, by which, at the end of a prayer, we mean, *so be it;* at the end of a creed, *so it is.*

Amen, among the Jews, was uſed likewiſe to affirm any thing, and was a ſort of affirmation uſed often by our Saviour: *Amen, amen, lego umin,* i. e. *Verily, verily, I say unto you.* It is alſo underſtood as expreſſing a wiſh; as *Amen, So be it.* The Greek and Latin churches have preſerved this word in their prayers as *ballelujab* and *hosannab;* becauſe they obſerved more energy in them, than in any terms which they could uſe in their own language. At the concluſion of the public prayers, the people anſwered with a loud voice, Amen; and St. Jerome ſays, that at Rome when the people anſwered Amen, the ſound of their voices was like a clap of thunder. The Jews aſſert, that the gates of heaven are opened to him who anſwers *Amen* with all his might!

AMENABLE, *adj.* reſponſible; ſubject ſo as to be liable to enquiries or accounts.

AMEND, or Amende, in the ci-devant French cuſtoms, was a pecuniary fine, impoſed by a judge for any crime, falſe proſecution, or groundleſs appeal.

To Amend, *v. a.* 1. To correct; to change any thing that is wrong to ſomething better.—2. To reform the life, or leave wickedneſs. In theſe two caſes we uſually write *mend.* See Mend.

To Amend, *v. n.* to grow better.

AMENDABLE, that which can be amended.

AMENDE Honorable, was an infamous kind of puniſhment formerly inflicted in France, under the old government, upon traitors, parricides, or ſacrilegious perſons, in the following manner: The offender being delivered into the hands of the hangman, his ſhirt was ſtripped off, a rope put about his neck, and a taper in his hand; then he was led into court, where he was obliged to beg pardon of God, the king, the court, and his country. Sometimes the puniſhment ended here; but ſometimes it was only a prelude to baniſhment, to the gallies, impriſonment in the baſtile, death or torture. Amende honorable is alſo a term uſed for making recantation in open court, or in preſence of the perſon injured.

AMENDER, *n. s.* the perſon that amends any thing.

AMENDMENT, *n. s.* 1. A change from bad for the better.—2. Reformation of life.—3. Recovery of health.

AMENDS, *n. s.* recompence; compenſation; atonement.

AMENIA, a thriving townſhip of Dutcheſs county, N. York, is ſix miles from Sharon, Litchfield county, Connecticut. It contained in 1790, 3078 inhabitants, of whom 52 were ſlaves.

AMENITY, *n. s.* pleaſantneſs; agreeableneſs of ſituation.

To AMERCE, *v. a.* to puniſh with a pecuniary penalty; to exact a fine; inflict a forfeiture.

AMERCEMENT, Amerciament, *n. s.* the pecuniary puniſhment of an offender, who ſtands at the mercy of the court. It differs from a fine in being impoſed arbitrarily in proportion to the fault; whereas a fine is a certain puniſhment ſettled expreſly by ſome ſtatute.

AMERICA, [ſo named from Americus Vespusius the pretended diſcoverer,] one of the four quarters or grand diviſions of the globe, univerſally allowed to be the largeſt of the whole, and from its diſcovery, frequently denominated the *New World.* This vaſt continent is waſhed by the two great oceans; being bounded on the E. by the Atlantic, which divides it from Europe and Africa; and on the W. by the Pacific, or Great South Sea, which ſeparates it from Aſia. It extends from Cape Horn, its moſt ſoutherly extremity, in Lat. 56, S. to the North Pole; and ſpreads between the 40th degree E. and the 100th W. Long. from Philadelphia. It is nearly 10,000 miles in length from N. to S. Its average breadth, from E. to W. is about 1400 or 1500 miles; but at its broadeſt part it meaſures 3690 miles. It is ſaid to contain upwards of 14,000,000 ſquare miles. As America lies in both hemiſpheres, it poſſeſſes all the varieties of ſoil, climate, and productions, which the earth affords. It ſtretches through all the five zones, and has two ſummers, as well as two winters in the year. The moſt remarkable difference, between the New and Old World, is the general predominance of cold throughout the whole extent of America, for which various cauſes have been aſſigned. The following is the opinion of the late learned Dr. Robertſon on this ſubject. "Though the utmoſt extent of America towards the north be not yet diſcovered, we know that it advances nearer to the pole than either Europe or Aſia. The latter have large ſeas to the north, which are open during part of the year; and, even when covered with ice, the wind that blows over them, is leſs intenſely cold, than that which blows over land in the ſame latitudes. But, in America, the land ſtretches from the river St. Lawrence towards the pole, and ſpreads out immenſely to the weſt. A chain of enormous mountains, covered with ſnow and ice, runs through all this dreary region. The wind paſſing over ſuch an extent of high and frozen land, becomes ſo impregnated with cold, that it acquires a piercing keenneſs, which it retains in its progreſs through warmer climates; and is not entirely mitigated, until it reach the gulf of Mexico. Over all the continent of North America, a north weſterly wind and exceſſive cold are ſynonymous terms. Even in the moſt ſultry weather, the moment that the wind veers to that quarter, its penetrating influence is felt in a tranſition from heat to cold no leſs violent than ſudden. To this powerful cauſe we may aſcribe the extraordinary dominion of cold, and its violent inroads into the ſouthern provinces in that part of the globe. Other cauſes, no leſs remarkable, diminiſh the active power of heat in thoſe parts of the American continent which lie between the tropics. In all that portion of the globe, the wind blows in an invariable direction from E. to W. As this wind holds its courſe along the ancient continent, it arrives at the countries which ſtretch along the weſtern ſhore of Africa, inflamed with all the fiery particles which it hath collected from the ſultry plains of Aſia, and the burning ſands in the African deſarts. The coaſt of Africa is accordingly the region of the earth which feels the moſt fervent heat, and is expoſed to the unmitigated ardour of the torrid zone. But this ſame wind, which brings ſuch an acceſſion of warmth to the countries lying between the river of Senegal and Caffraria, traverſes the Atlantic ocean before it reaches the American ſhore. It is cooled in its paſſage over this vaſt body of water; and is felt as a refreſhing gale along the coaſt of Brazil and Guiana, rendering thoſe countries, though amongſt the warmeſt in America, temperate, when compared with thoſe which lie oppoſite to them in Africa. As this wind advances in its courſe acroſs America, it meets with immenſe plains covered with impenetrable foreſts; or occupied by large rivers, marſhes, and ſtagnating waters, where it can recover no conſiderable degree of heat. At length it arrives at the Andes, which run from N. to S. through the whole continent. In paſſing over their elevated and frozen ſummits, it is ſo thoroughly cooled that the greater part of the countries beyond them hardly feel the ardour to which they ſeem expoſed by their ſituation. In the other provinces of America, from Terra Firma, weſtward to the Mexican empire, the heat of the climate is tempered, in ſome places, by the elevation of the land above the ſea; in others, by their extraordinary humidity: and in all, by the enormous mountains ſcattered over this tract. The iſlands of America, in the torrid zone, are either ſmall or mountainous, and are fanned alternately by refreſhing ſea and land breezes. The cauſes of the extraordinary cold towards the ſouthern limits of America, and in the ſeas beyond it, cannot be aſcertained in a manner equally ſatisfying. The moſt obvious and probable cauſe of this ſuperior degree of cold towards the ſouthern extremity of America, ſeems to be the form of the continent there. Its breadth gradually decreaſes as it ſtretches from St. Antonio ſouthwards, and from the bay of St. Julian to the ſtraits of Magellan its dimenſions are much contracted.—From its ſouthern point, it is probable that an open ſea ſtretches to the antarctic pole. In whichever of theſe directions the wind blows, it is cooled before it approaches the Magellanic regions, by paſſing over a vaſt body of water; nor is the land there of ſuch extent, that it can recover any conſiderable degree of heat in its progreſs over it. Theſe circumſtances concur in rendering the temperature of the air in this diſtrict of America, more ſimilar to that of an inſular, than to that of a continental climate; and hinder it from acquiring the ſame degree of ſummer heat, with places in Europe and Aſia, in a correſponding northern latitude. The north wind is the only one that reaches this part of America, after blowing over a great continent. But, from an attentive ſurvey of its poſition, this will be found to have a tendency rather to diminiſh than augment the degree of heat. The ſouthern extremity of America is properly the termination of the immenſe ridge of the Andes, which ſtretches nearly in a direct line from north to ſouth, through the whole extent of the continent. The moſt ſultry regions in South America, Guiana, Brazil, Paraguay, and Tucuman, lie many degrees to the eaſt of the Magellanic regions. The level country of Peru, which enjoys the tropical heats, is ſituated conſiderably to the weſt of them. The north wind, then though it blows over land, does not bring to the ſouthern extremity of America, an increaſe of heat, collected in its paſſage over torrid regions; but, before it arrives there, it muſt have ſwept along the ſummit of the Andes, and come impregnated with the cold of that frozen region." Another peculiarity in the climate of America, is its extenſive moiſture. In ſome places, indeed, on the weſtern coaſt, rain is not known; but, in all other parts, the moiſtneſs of the climate is as remarkable as the cold. The moſt prevalent cauſe is the vaſt quantity of water in the Atlantic and Pacific Oceans, with which America is environed on all ſides. Hence thoſe places, where the continent is narroweſt, are deluged, with almoſt perpetual rains, accompanied with violent thunder and lightning, by which ſome of them, particularly Porto Bello, are rendered in a manner uninhabitable. The extreme moiſture of the American climate is productive of much larger rivers there than in any other part of the world. The Danube, the Nile, the Indus, or the Ganges, are not comparable to the Miſſiſſippi, the river St. Laurence, or that of the Amazons; nor are ſuch lakes to be found any where as thoſe which North America affords. To the ſame cauſe we are alſo partly to aſcribe the exceſſive luxuriance of all kinds of vegetables in almoſt all parts of this country. From the coldneſs and the moiſture of America, an extreme malignity of climate has been inferred, and aſſerted by M. de Paw in his *Recherches Philoſophiques*, as well as by Buffon, an idea which is fully refuted by the Abbe Clavigero, in his hiſtory of Mexico.

AMERICV, DISCOVERRY OF. It is believed by many, and not without ſome plauſible foundation, that America was known to the ancients. Of this, however, hiſtory affords no certain evidence. Whatever diſcoveries may have been made in the weſtern world, by the Carthaginians, the Norwegians, the Germans by Madoc, prince of N. Wales, or other early adventurers, they have long been loſt to the world, if indeed they ever exiſted.

Chriſtopher Columbus, who undoubtedly deſerves the honor of having diſcovered America, was by birth a Genoeſe; and who had been early trained to a ſeafaring life, and, having acquired every branch of knowledge connected with that profeſſion, was no leſs diſtinguiſhed by his ſkill and abilities, than for his intrepid and perſevering ſpirit. This man, when about forty years of age, had formed the great idea of reaching the Eaſt-Indies by ſailing weſtward: but, as his fortune was very ſmall, and the attempt required very effectual patronage, deſirous that his native country ſhould profit by his ſucceſs, he laid his plan before the ſenate of Genoa, but the ſcheme appearing chimerical, it was rejected. He then repaired to the court of Portugal; and although the Portugueſe were at that time diſtinguiſhed for their commercial ſpirit, and John II. who then reigned, was a diſcerning and enterpriſing prince, yet the prepoſſeſſions of the great men in his court, to whom the matter was referred, cauſed Columbus finally to fail in his attempt there alſo. He next applied to Ferdinand and Iſabella, king and queen of Arragon and Caſtile, and at the ſame time ſent his brother Bartholomew (who followed the ſame profeſſion, and who was well qualified to fill the immediate place under ſuch a leader) to England, to lay the propoſal before Henry VII. which likewiſe, very fortunately for the future well being of the country, met with no ſucceſs.—Many were the years which Chriſtopher Columbus ſpent in ineffectual attendance at the Caſtilian court; the impoveriſhed ſtate into which the finances of the united kingdoms were reduced, by the war with Granada, repreſſing every diſpoſition to attend to great deſigns; but the war being at length terminated, the powerful mind of Iſabella broke all obſtacles; ſhe declared herſelf the patroneſs of Columbus, whilſt her huſband Ferdinand, declining to partake as an adventurer in the voyage, only gave it the ſanction of his name. Thus did the ſuperior genius of a woman effect the diſcovery of one half the globe!

The ſhips ſent on this important ſearch were only three in number, two of them very ſmall: they had ninety men on board. Although the expence of the expedition had long remained the ſole obſtacle to its being undertaken, yet, when every thing was provided, the coſt did not amount to more than $17,760, and there were twelve months proviſions put on board.

Columbus ſet ſail from Port Palos, in the province of Andaluſia, on the third of Auguſt 1492: he proceeded to the Canary iſlands, and from thence directed his courſe due W. in the latitude of about 28. N. In this courſe he continued for two months, without falling in with any land: which cauſed ſuch a ſpirit of diſcontent and mutiny to ariſe, as the ſuperior addreſs and management of the commander became unequal to repreſs, although for theſe qualities he was eminently diſtinguiſhed. He was at length reduced to the neceſſity of entering into a ſolemn engagement to abandon the enterpriſe, and return home, if land did not appear in three days. Probably he would not have been able to reſtrain his people ſo long from acts of violence and outrage, in purſuing ſo untried and dreary a courſe, had they not been ſenſible that their ſafety in returning home, depended very much on his ſkill as a navigator, in conducting the veſſels.

At length the appearance of land changed their deſpondency to the moſt exulting rapture. It was an iſland abounding with inhabitants, both ſexes of which were quite naked; their manners kind, gentle, and unſuſpecting. *Columbus* named it San Salvador: It is one of the cluſter which bears the general name of *Bahamas*; it was only 3. 30. lat. to the S. of the iſland of *Gomera*, one of the *Canaries*, from whence he took his departure. This navigator was ſtill ſo confirmed in the opinion which he had formed before he undertook the voyage, that he believed himſelf to be then upon an iſland which was ſituated adjacent to the Indies. Proceeding to the S. he ſaw three other iſlands, which he named St. Mary of the Conception, Ferdinand, and Iſabella. At length he arrived at a very large iſland, & as he had taken 7 of the natives of San Salvador on board he learned from them that it was called Cuba, but he gave it the name of Juanna. He next proceeded to an iſland which he called *Espagnola*, in honor of the kingdom by which he was employed, and it ſtill bears the name of *Hispaniola*. Here he built a fort, and formed a ſmall ſettlement. He then returned home, having on board ſome of the natives, whom he had taken from the different iſlands; ſteering a more ſouthern courſe, he fell in with ſome of the *Caribbee* iſlands; and arrived at the Port of Palos on the 15th of March 1493, having been ſeven months and eleven days on this moſt important voyage.

On his arrival, letters patent were iſſued by the king and queen confirming to Columbus and to his heirs all the privileges contained in a capitulation which had been executed before his departure, and his family ennobled.

Not only the Spaniards, but the other nations of Europe, ſeem to have adopted the opinion of Columbus, in conſidering the countries which he had diſcovered as a part of India. Whence Ferdinand and Iſabella gave them the name "Indies," in the ratification of their former agreement with Columbus. Even after the error was detected, the name was retained, and the appellation of "Weſt-Indies" is now given by all Europe to this country, and that of Indians to the inhabitants. That the Eaſt-Indies might be reached by a weſtern courſe was proved not long after by *Magellan*; the only error therefore imputable to Columbus, is his ſuppoſing them ſo near to Europe, in that direction, which implies that he had no accurate idea of the circumference of the globe; as ſuch an opinion was founded entirely on its ſpherical form. It is indeed remarkable how many of the conjectures which have been made, and opinions formed, by the moſt intelligent and enlightened of mankind, in all ages, reſpecting the globe, have been found to be erroneous, when experiment has ſubſtituted fact for opinion. A ſtriking inſtance is in the ſuppoſed exiſtence of a *terra auſtralis incognita*, which when inveſtigated by captain Cook, vaniſhed like the baſeleſs fabric of a viſion. The opinion of a northern paſſage to the E. Indies, whether by an eaſtern or a weſtern courſe, was no leſs believed, and is now, no leſs confuted; for, although it ſeems highly probable that no land lies in the high northern latitudes, yet a barrier equally impenetrable, is formed by the immenſe expanſe of ice, which ever occupies the polar regions.

Nothing could poſſibly tend more effectually to rouſe every active principle in human nature, than the diſcoveries which Columbus had made; no time was, therefore loſt, nor expence ſpared, in preparing a fleet of ſhips, with which this great man ſhould reviſit the countries made known.—Seventeen ſhips were got ready in ſix months, and 1550 perſons embarked on board them, among whom were many of noble families, and who had filled honourable ſtations. Theſe engaged in the enterprizes from the expectations, that the newly diſcovered country was either the Cephango of Marco Paulo, or the Ophir, from which Solomon obtained his gold and precious merchandize.

In September 1493, Columbus ſailed upon his ſecond voyage to America; during the performance of which, he diſcovered the iſlands of Dominica, Marigalante, Guadaloupe, Montſerrat, Antigua, Porto Rico, and Jamaica; and returned to Spain in 1496. In 1498 he ſailed a third time for America; and on the 1ſt of Auguſt, attained the great object of his ambition, by diſcovering the CONTINENT of America, near the mouth of the Oroonoko. He then coaſted along weſtward, making other diſcoveries for 200 leagues, to Cape Vela, from which he croſſed over to Hiſpaniola. His ſucceſs produced a crowd of adventurers, among whom Sebaſtian Cabot, in the ſervice of Henry VII. of England, had the good fortune to diſcover the Northern Continent in 1497. In 1502 Columbus made his fourth voyage to Hiſpaniola; thence he went over to the Continent, diſcovered the Bay of Honduras; thence ſailed along the main ſhore eaſterly 200 leagues, to Cape Gracias a Dios, Veragua, Porto Bello, and the Gulf of Darien. Here it may be proper to add, that, among other adventurers to the new world, was Americus Veſpucius, a Florentine gentleman, whom Ferdinand had appointed to draw ſea-charts, and to whom he had given the title of chief pilot. This man accompanied Ojeda, an enterpriſing Spaniſh adventurer to America; and having with much art, and ſome degree of elegance, drawn up an amuſing hiſtory of his voyage, he publiſhed it to the world. It was circulated rapidly, and read with admiration. In his narrative he had inſinuated that the glory of having firſt diſcovered the continent in the new world belonged to him.—This was in part believed, and the country began to be called after the name of its ſuppoſed firſt diſcoverer. The unaccountable caprice of mankind has perpetuated the error; ſo that now, by the univerſal conſent of all nations, this new quarter of the world is called AMERICA. Thus the name of Americus has ſupplanted that of Columbus, and mankind are left to regret an act of injuſtice which, having been ſanctioned by time, they can never redreſs.

AMERICA, GENERAL DIVISIONS OF. This vaſt continent is divided almoſt in two, by an iſthmus about 1500 miles in length, and in one place ſo narrow as to be only about 60 miles over. All the continent to the North of this iſthmus, together with the iſthmus itſelf, is ſtyled North America; and all to the South of it, including that even on this ſide the Equator, is called South America. This narrow neck is called the iſthmus of Darien. See DARIEN. N. America is that grand diviſion of the New World, which extends N. and S. from about the 10th deg. of N. Lat. to the N. Pole, and E. and W. from the 30th E. to the 93d deg. of W. Long. from Philadelphia. It is bounded on the E. by the Atlantic Ocean; on the S. by S. America, to which it is joined by the Iſthmus of Darien; on the W. by the Pacific Ocean, and the Sea of Kamtſchatka; on the N. as it is ſuppoſed, by the Arctic Icy Ocean. But its utmoſt northern extent is not known, few or no diſcoveries having been yet made beyond the 70th deg. of N. Lat. In July 1779, indeed, Captain Cook proceeded as far as Lat. 71. when he came to a ſolid body of ice, which he ſuppoſed to extend from continent to continent. North America comprehends that vaſt tract of country which is now poſſeſſed by the United States, the Britiſh and Spaniſh colonies, and the original natives. It was diſcovered at a period, when the arts and ſciences had made very conſiderable progreſs in Europe. Many of the firſt adventurers were men of genius and learning, and were careful to preſerve authentic records of ſuch of their proceedings as would be intereſting to poſterity. Theſe records afford ample documents for American hiſtorians. Perhaps no people on the globe can trace the hiſtory of their origin and progreſs with ſo much preciſion as the inhabitants of North America; particularly that part of them who inhabit the territory of the United States.

AMERICA, N. FIRST SETTLEMENTS IN. The fame which Columbus had acquired by his firſt diſcoveries on this weſtern continent, ſpread through Europe, and inſpired many with the ſpirit of enterprize. As early as 1496, only four years after the firſt diſcovery of America, John Cabot, a Venetian, obtained a commiſſion from Henry VII. to diſcover unknown lands, and annex them to the crown. In the ſpring he ſailed from England with two ſhips, carrying with him his three ſons. In this voyage, which was intended for China, he fell in with the N. ſide of Terra Labrador, and coaſted as far as 67. Lat. N.—Next year he made a ſecond voyage with his ſon Sebaſtian, who afterwards proceeded in the diſcoveries which his father had begun. On the 24th of June, he diſcovered Bonaviſta, on the N. E. ſide of Newfoundland; traverſed the coaſt from Davis's Straits to Cape Florida; and in 1502, brought three natives of Newfoundland to Henry VII. In 1513, John Ponce ſailed from Porto-Rico northerly, and diſcovered the continent in 30. 8. Lat. N. He landed in April, a ſeaſon when the country around was covered with verdure, and in full bloom. This circumſtance induced him to call the country FLORIDA, which, for many years, was the common name for both N. and S. America.—In 1516, Sir Sebaſtian Cabot and Sir Thomas Pert, explored the coaſt as far as Brazil in South America. This vaſt extent of country, the coaſt whereof was thus explored, remained unclaimed and unſettled by any European power (except by the Spaniards in South America,) for almoſt a century from the time of its diſcovery. It was not till 1524 that France attempted diſcoveries on the American coaſt. Stimulated by his enterpriſing neighbours, Francis I. ſent John Verrazona, a Florentine, to America, to make diſcoveries; who traverſed the coaſt from Lat. 28. to 50. N. but in a ſecond voyage, ſome time after, was loſt. In 1525, Stephen Gomez, ſailed from Groyn in Spain, to Cuba and Florida, thence northward to Cape Razo, in Lat. 46. N. in ſearch of a N. W. paſſage to the Eaſt Indies. In the ſpring 1534, by the direction of Francis I. a fleet was fitted out at St. Malo's in France, with deſign to make diſcoveries. The command of this fleet was given to James Cartier. He arrived at Newfoundland in May of this year. Thence he ſailed northerly; and, on the day of the feſtival of St. Lawrence, he found himſelf in about Lat. 43. 30. N. in the midſt of a broad gulf, which he named St. Lawrence. He gave the ſame name to the river which empties into it. In this voyage, he ſailed as far N. as Lat. 51. expecting in vain to find a paſſage to China. Next year he ſailed up the river St. Lawrence 300 leagues to a great and ſwift fall. He called the country New

France; built a fort in which he ſpent the winter, and returned in the following ſpring to France. In 1522, Francis la Roche was ſent to Canada, by the French king, with three ſhips and 200 men, women and children. They wintered here in a fort which they had built, and returned in the ſpring. In 1578, the king of France commiſſioned the Marquis de la Roche to conquer Canada, and other countries not poſſeſſed by any Chriſtian prince. We do not learn, however, that la Roche ever attempted to execute his commiſſion, or that any further attempts were made to ſettle Canada during this century. On 12th May, 1539, Ferdinand de Soto, with 900 men, beſides ſeamen, ſailed from Cuba, having for his object the conqueſt of Florida. On the 30th of May, he arrived at Spirito Santo, from whence he travelled northward 450 leagues from the ſea. Here he diſcovered a river of a qnarter of a mile wide, and 19 fathoms deep, on the bank of which he died and was buried, May 1552, aged 42 years. Alverdo, his ſucceſſor, built 7 brigantines, and the year following embarked upon the river. In 17 days he proceeded down the river 400 leagues, where he judged it to be 15 leagues wide. From the largeneſs of the river at that place of his embarkation, he concluded its ſource muſt have been more than 800 leagues. As he paſſed down the river, he found it opened by two mouths into the gulf of Mexico. Theſe circumſtances lead us to conclude, that this river, ſo early diſcovered, was the one which we now call the Miſſiſippi. In 1562, admiral Chatillon of France, ſent out a fleet under the command of John Ribalt. He arrived at Cape Francois on the coaſt of Florida, near which, on the firſt of May, he diſcovered and entered a river which he called May river. It is probable, this river is the ſame which we now call St. Mary's, which forms a part of the ſouthern boundary of the United States. As he coaſted northward he diſcovered 8 other rivers, one of which he called Port Royal, and ſailed up it ſeveral leagues. On one of the rivers he built a fort, and called it Charles, in which he left a colony, under the direction of captain Albert. The ſeverity of Albert's meaſures excited a mutiny, in which, to the ruin of the colony, he was ſlain. Two years after, Chatillon ſent Rene Laudomer, with three ſhips, to Florida. In June he arrived at the river May, on which he built a fort, and, in honour of his king Charles IX. he called it CAROLINA. In Auguſt, capt. Ribalt arrived at Florida the ſecond time, with a fleet of ſeven veſſels to recruit the colony, which, two years before, he had left under the direction of the unfortunate capt. Albert. In September, Pedro Melandes, with ſix Spaniſh ſhips, purſued Ribalt up the river on which he had ſettled, and overpowering him in numbers, cruelly maſſacred him and his whole company. Melandes, having in his way taken poſſeſſion of the country, built three forts, and left them garriſoned with 1200 ſoldiers. Laudomier and his colony on May river, receiving information on the fate of Ribalt, took the alarm, and eſcaped to France. In 1567, a fleet of three ſhips was ſent from France to Florida, under the command of Dominique de Gourges. The object was to diſpoſſeſs the Spaniards of that part of Florida which they had ſo cruelly and unjuſtifiably ſeized 3 years before. He arrived on the coaſt of Florida, April 1568, and ſoon after made a ſucceſsful attack upon the forts. The recent cruelty of Melandes and his company excited revenge and retaliation. He took the forts; put moſt of the Spaniards to the ſword, and having buried and demoliſhed all their fortreſſes, returned to France. In 1576, capt. Frobiſher was ſent to find out a N. W. paſſage to the Eaſt Indies. The firſt landing which he made on the coaſt was upon a cape, which he called Queen Elizabeth's Foreland. In coaſting northerly he diſcovered the ſtraits which bear his name. He proſecuted his ſearch for a paſſage into the Atlantic ocean, till he was prevented by the ice, and then returned to England. In 1579, Sir Humphrey Gilbert obtained a patent from queen Elizabeth for lands not yet poſſeſſed by any Chriſtian prince, provided he would take poſſeſſion within ſix years. With this encouragement he ſailed for America, and on the firſt of Auguſt, 1583, anchored in Conception Bay. Afterwards he diſcovered and took poſſeſſion of St. John's Harbour, and the country ſouth; but in purſuing his diſcoveries he was unfortunately loſt, and the intended ſettlement was prevented. In 1584, two patents were granted by queen Elizabeth, one to Adrian Gilbert, the other to Sir Walter Raleigh, for lands not in the poſſeſſion of any Chriſtian prince. By the direction of Sir Walter, two ſhips were fitted and ſent out, under the command of Philip Amidas, and Arthur Barlow. In July they arrived on the coaſt, and anchored in a harbour 7 leagues W. of the Roanoke. On the 13th July, they took poſſeſſion of the country, and in honour of their virgin queen Elizabeth, they called it Virginia, which for ſome time after became the common name for all North America. In 1585, Sir Walter Raleigh ſent Sir Richard Grenville to America with ſeven ſhips. He arrived at Wococon harbour in June. Having ſtationed a colony of more than 100 people at Roanoke, under the direction of Capt. Ralph Lane, he coaſted N. E. as far as Cheſapeake Bay. The colony under Capt. Lane endured extreme hardſhips, and muſt have periſhed, had not Sir Francis Drake fortunately returned to Virginia and carried them to England, after having made ſeveral conqueſts for the queen in the Weſt-Indies and other places. A fortnight after, Sir Richard Grenville arrived with new recruits; and left 50 men at the ſame place. In 1587, Sir Walter ſent another company to Virginia, under governor White, with a charter, and twelve aſſiſtants. In July he arrived at Roanoke. Not one of the ſecond company remained. He determined, however to riſk a third colony. Accordingly he left 115 people at the old ſettlement, and returned to England. In 1590, governor White came over to Virginia with ſupplies and recruits for his colony; but, to his great grief, not a man was to be found. They had all miſerably famiſhed with hunger, or had been maſſacred by the Indians. In 1602, Bartholomew Goſnold, with 35 perſons, made a voyage to North Virginia, and diſcovered and gave names to Cape Cod, Martha's Vineyard, and Elizabeth iſlands, and to Dover Cliff. Elizabeth Iſland was the place which they fixed for their ſettlement. But the courage of thoſe who ſhould have remained failing, they all returned to England. All the attempts to ſettle this continent which were made by the Dutch, French, and Engliſh, from its diſcovery to that time, a period of 100 years, proved ineffectual. The Spaniards only, of all the European nations, had been ſucceſsful. In 1603, Martin Pring and William Brown were this year ſent by Sir Walter Raleigh,

which

with two ſmall veſſels, to make diſcoveries in North Virginia. They came upon the coaſt, which was broken with a multitude of iſlands, in lat. 43. 30. N. They coaſted ſouthward to Cape Cod Bay: thence round the Cape into a commodious harbour, in lat. 41. 25. where they went aſhore and tarried ſeven weeks, during which time thay loaded one of their veſſels with ſaſſafras, and returned to England. Bartholomew Gilbert, in a voyage to S. Virginia, in ſearch of the third colony which had been left there by governor White in 1587, having touched at ſeveral of the Weſt-India Iſlands, landed near Cheſapeake Bay, where, in a ſkirmiſh with the Indians, he and four of his men were unfortunately ſlain. The reſt, without any farther ſearch for the colony, returned to England. France, being at this time in a ſtate of tranquillity, in conſequence of the edict of Nants in favour of the Proteſtants, paſſed by Henry IV. in 1598, and of the peace with Philip king of Spain and Portugal, was induced to purſue her diſcoveries in America. Accordingly the king ſigned a patent in favour of de Mons, in 1603, of all the country from the 40th to the 46th degrees of N. Lat. under the name of Acadia. Next year De Mons ranged the coaſt from St. Lawrence to Cape Sable, and ſo round to Cape Cod. In May 1605, George's Iſland and Penticoaſt harbour were diſcovered by Capt. George Weymouth. In May he entered a large river in lat. 43. 20. (variation 11° 15′ weſt,) which Mr. Prince, in his chronology, ſuppoſes muſt have been Sagadahock; but from the lat. it was more probably the Piſcataqua. In ſpring 1606, James I. by patent, divided Virginia into two colonies. The ſouthern included all lands between the 34th and 41ſt degrees of N. Lat. This was ſtyled the firſt colony, under the name of S. Virginia, and was granted to the London Company. The northern called the ſecond colony, and known by the general name of N. Virginia, included all lands between the 38th and 45th degrees N. lat. and was granted to the Plymouth Company. Each of theſe colonies had a council of 13 men to govern them. To prevent diſputes about territory, the colonies were prohibited from planting within 100 miles of each other. Both the London and Plymouth companies enterprized ſettlements within the limits of their reſpective grants. Mr. Percy, brother of the Earl of Northumberland, in the ſervice of the London company, went over with a colony to Virginia, and diſcovered Powhatan, now James River. In the mean time the Plymouth company ſent Captain Henry Challons, in a veſſel of 55 tons, to plant a colony in N. Virginia; but in his voyage he was taken by a Spaniſh fleet and carried into Spain. In 1607, the London company ſent Chriſtopher Newport with three veſſels to S. Virginia. On the 26th April he entered Cheſapeake Bay, and landed, and ſoon after gave to the moſt ſouthern point the name of Cape Henry, which it ſtill retains. Having elected Mr. Edward Wingfield preſident for the year, they next day landed all their men, and begun a ſettlement on James river, at a place which they called James-Town. This is the firſt town that was ſettled by the Engliſh in North America. In June following Capt. Newport ſailed for England, leaving with the preſident 104 perſons. In Auguſt, died Capt. Bartholomew Goſnold, the firſt projector of this ſettlement, and one of the council. The following winter James-Town was burnt. During this time the Plymouth company fitted out two ſhips under the command of Admiral Rawley Gilbert. They ſailed for N. Virginia on the 31ſt of May, with 100 planters, and Capt. George Popham for their preſident. They arrived in Auguſt, and ſettled about 9 or 10 leagues S. of the mouth of Sagadahock river. A great part of the colony, however, diſheartened by the ſeverity of the winter, returned to England in December, leaving their preſident, Capt. Popham, with only 45 men. In the fall of this year, the famous Mr. Robinſon, with part of his congregation, who afterwards ſettled at Plymouth, in New-England, removed from the N. of England, to Holland, to avoid perſecution. and enjoy purity of worſhip and liberty of conſcience. In the ſame year a ſmall company of merchants at Dieppe and St. Malo's founded Quebec. In 1608, the Sagadahock colony ſuffered incredible hardſhips after the departure of their friends in December. In the depth of winter, which was extremely cold, their ſtorehouſe caught fire, and was conſumed with moſt of their proviſions and lodgings. Their misfortunes were increaſed, ſoon after, by the death of their preſident. Rawley Gilbert was appointed to ſucceed him. Lord Chief Juſtice Popham made every exertion to keep this colony alive, by repeatedly ſending them ſupplies. But his death, which happened this year, together with Gilbert's being called to England to ſettle his affairs, broke up the colony, and they all reeurned with him to England. The unfavourable reports which theſe firſt adventurers propagated reſpecting the country, prevented any further attempts to ſettle N. Virginia for ſeveral years after. In 1608, the London Company ſent Capt. Nelſon, with two ſhips and 120 perſons, to James-Town; and in 1609 Capt. Smith, afterwards preſident, arrived on the coaſt of S. Virginia, and by ſailing up a number of rivers, diſcovered the interior country. In September, Capt. Newport arrived with 70 perſons, which increaſed the colony to 200 ſouls. The council for S. Virginia having reſigned their old commiſſions, obtained a new one; in conſequence of which they appointed Lord de la War, general of the colony; Sir Thomas Gates, his lieutenant; Sir George Somers, admiral; Sir Thomas Dale, high marſhal; Sir Ferdinand Wainman, general of the horſe, and Capt. Newport, vice-admiral. In June, Sir T. Gates, admiral Newport, and Sir George Somers, with ſeven ſhips, having 500 ſouls on board, ſailed from Falmouth for S. Virginia. In croſſing the Bahama Gulph, on the 24th July, the fleet was overtaken by a violent ſtorm, and ſeparated. Four days after, Sir George Somers ran his veſſel aſhore on one of the Bermuda Iſlands, which from this circumſtance have been called the Somer Iſlands. The people on board, 150 in number, all got ſafe on ſhore, and there remained until the following May. The remainder of the fleet arrived at Virginia in Auguſt. The colony was now increaſed to 500 men. When Captain Smith, then preſident, meeting with oppoſition from thoſe who had lately arrived, left the colony and returned to England. Francis Weſt, his ſucceſſor in office, ſoon followed him, and George Piercy was elected preſident. In 1610 the S. Virginia or London company gave a patent to Lord De la War, conſtituting him governor and captain general of South Virginia. He ſoon after embarked for America with Captain Argal and 150 men in three ſhips. The unfortunate people, who, the year before, had been ſhipwrecked on the Bermuda Iſlands, had employed themſelves during the winter and ſpring, under the direction of Sir Thomas Gates, Sir George Somers, and admiral Newport, in building a ſloop to tranſport themſelves to the continent. They embarked for Virginia on the 10th of May, with about 150 perſons on board, leaving two men behind who choſe to ſtay, and landed at James-Town, on the 23d of the ſame month. Finding the colony, which at the time of Captain Smith's departure, conſiſted of 500, now reduced to 60, and thoſe few in a diſtreſſed and wretched ſituation, they reſolved to return to England; and on the 7th of June, the whole colony broke up the ſettlement, and ſailed down the river on their way to their native country. Fortunately, Lord De la War, who had embarked for James-Town the March before, met them the day after they had ſailed, and perſuaded them to return with him to James-Town, where they arrived and landed on the 10th of June.—The government of right devolved upon Lord De la War. From this time we may date the effectual ſettlement of Virginia, See VIRGINIA. As early as the year 1608, or 1609, Henry Hudſon, an Engliſhman, under a commiſſion from king James I. diſcovered Long-Iſland, New-York, and the river which bears his name, and afterwards ſold the country, or rather his right, to the Dutch. They, however, contended that Hudſon was ſent out by the Eaſt India Company in 1609, to diſcover a paſſage to China; and that having firſt diſcovered Delaware Bay, he came and penetrated Hudſon's river, as far as lat. 43. N. It is ſaid, however, that there was a ſale, and that the Engliſh objected to it, though for ſome time they neglected to oppoſe the Dutch ſettlement of the country. In 1610, Hudſon ſailed again to this country, then called by the Dutch New Netherlands, and four years after, the ſtates general granted a patent to ſundry merchants for an excluſive trade on the North river, who, in 1614, built a fort on the W. ſide near Albany. From this time we may date the ſettlement of NEW-YORK, which ſee. Conception Bay, on the iſland of Newfoundland, was ſettled in 1610, by about 40 planters, under governor John Guy, to whom king James had given a patent of incorporation. Champlain, a Frenchman, had begun a ſettlement at Quebec, 1608. Between 1614 and 1620, ſeveral attempts were made by the Plymouth company to ſettle New-England, but, from various cauſes, they were all rendered ineffectual. During this time, however, an advantageous trade was carried on with the natives. In the year 1620, a part of Mr. Robinſon's congregation came over and ſettled at Plymouth. At this time commenced the ſettlement of NEW ENGLAND, which ſee. In 1621, capt. John Maſon obtained of the Plymouth council a grant of a part of the preſent ſtate of New-Hampſhire. Two years after, under the authority of this grant, a ſmall colony ſettled near the mouth of Piſquataqua river. From this period we may date the ſettlements of NEW-HAMPSHIRE, which ſee. In 1627, a colony of Swedes and Fins came over and landed at Cape Henlopen, to the Falls of Delawar on both ſides the river, which they called New Swedeland Stream. On this river they built ſeveral forts, and made ſettlements. On the 19th March, 1628, the council for New-England ſold to Sir Henry Roſwell, and 5 others, a large tract of land lying round Maſſachuſetts bay. In June following, capt. John Endicot, with his wiſe and company, came over and ſetled at Naumkeag, now called Salem. This was the firſt Engliſh ſettlement in Maſſachuſetts bay. Plymouth, indeed, which is now included in the commonwealth of Maſſachuſetts, was ſettled 8 years before, but at this time it was a ſeparate colony, under a diſtinct government, and continued ſo until the ſecond charter of Maſſachuſetts was granted by William and Mary in 1691; by which Plymouth, the province of Main and Sagadahock were annexed to Maſſachuſetts. In 1633, lord Baltimore, a Roman Catholic, applied for and obtained a grant of a tract of land upon Cheſapeake bay, about 140 miles long and 130 broad. Soon after in conſequence of the rigour of the laws of England againſt the Roman catholics, lord Baltimore, with a number of his perſecuted brethren, came over and ſettled in it, and in honour of queen Henrietta Maria, they called it Maryland. The firſt grant of Connecticut was made by Robert Earl of Warwick, preſident of the council of Plymouth, to Lord Say and Seal, to Lord Brook and others, in 1631. In conſequence of ſeveral ſmaller grants made afterwards by the patentees to particular perſons, Mr. Fenwick made a ſettlement at the mouth of Connecticut river, and called it Saybrook. Four years after, a number of people from Maſſachuſetts bay came and began ſettlements at Hartford, Wethersfield, and Windſor, on Connecticut river. Thus commenced the ſettlement of CONNECTICUT, which ſee. Rhode Iſland was firſt ſettled in conſequence of religious perſecution. Mr. Roger Williams, who was among thoſe who early came over to Maſſachuſetts, not agreeing with ſome of his brethren in ſentiment, was very unjuſtly baniſhed the colony, and went with his adherents, and ſettled at Providence in 1635. From this beginning aroſe the ſtate of Rhode Iſland. On the 20th of March 1664, Charles II. granted to the Duke of York what is now called New Jerſey, then a part of a large tract of country by the name of New Netherland. Some parts of New Jerſey were ſettled by the Dutch as early as about 1615. In 1662, Charles II. granted to Edward Earl of Clarendon, and 7 others, almoſt the whole territory of the three ſouthern ſtates, N. and S. Carolinas and Georgia. Two years after he granted a ſecond charter, enlarging their boundaries; but no effectual ſettlement was made until 1669. Thus commenced the ſettlement of Carolina, which then included the whole territory between the 29th and 36½ degrees N. latitude, together with the Bahama Iſlands, lying between lat. 22. and 27. N. The charter for Pennſylvania was granted to William Penn, on the 4th of March 1681. The firſt colony came over next year, and ſettled under the proprietor, William Penn, who acted as governor from October 1682 to Auguſt 1684. The proprietory government in Carolina was attended with ſo many inconveniences, and occaſioned ſuch violent diſſenſions among the ſettlers, that the Parliament of Great Britain was induced to take the province under their immediate care. The proprietors, (except Lord Granville,) accepted of $99,900 from the Crown for the property and juriſdiction. This agreement was ratified by act of Parliament, in 1729. A clauſe in this act reſerved to Lord Granville his 8th ſhare of the property and arrears of quit rents, which continued legally veſted in his family till the revolution in 1776. Lord Grenville's ſhare made a part of the preſent ſtate of

N. Carolina. About 1729, the extenſive territory belonging to the proprietors, was divided into N. and S. Carolinas. They remained ſeparate royal governments until they became independent ſtates, For the relief of indigent people of Great Britain and Ireland, and for the ſecurity of Carolina, a project was formed for planting a colony between the rivers Savannah and Alatamaha. Accordingly, George II. iſſued letters patent, dated 9th June 1732, for carrying into execution the benevolent plan. In honour of the King, who greatly encouraged the plan, they called the new province Georgia, and 21 truſtees were appointed to conduct the affairs relating to the ſettlement of the province. In November following, 115 perſons, among whom was General Oglethorpe, embarked for Georgia, and landed at Yamacraw. In exploring the country, they found an elevated pleaſant ſpot of ground on the back of a navigable river, upon which they marked out a town, and, from the Indian name of the river which paſſed by it, called it Savannah. From this period we may date the ſettlement of Georgia. Kentucky was firſt diſcovered by James Macbride, and ſome others in 1754. Col. Daniel Boon explored it in 1769. Four years after, Col. Daniel Boon and his family, with 5 other families, who were joined by 40 men from Powle's valley, began the ſettlement of Kentucky, which is now a very flouriſhing independent ſtate. The tract of country called Vermont, before the late war, was claimed both by New-York and New-Hampſhire. When hoſtilities commenced between Great Britain and her colonies, the inhabitants conſidering themſelves as in a ſtate of nature, and not within any legal juriſdiction, aſſociated and formed for themſelves a conſtitution of civil government. Under this conſtitution, they continued to exerciſe all the powers of an independent ſtate, before their actual admiſſion into the Union, March 4th 1791. The country now called Tenneſſee was included in the ſecond charter granted by King Charles II. to the proprietors of Carolina, and in a ſubſequent diviſion it belonged to N. Carolina. The firſt ſettlements commenced here in 1765, but its encreaſe in population was ſlow till after the peace in 1783, when the military lands being located in that country induced many officers and ſoldiers to repair thither for the ſake of ſecuring their lands; ſuch as did not chooſe to go, ſold their warrants to thoſe who did, and thus Tenneſſee was in a ſhort time inhabited by vaſt numbers from every part of the union. See TENNESSEE. The following TABLE gives a ſummary view when, and by whom, the firſt permanent ſettlements were made:

Names of places.	*When settled.*	*By whom.*
Carolina, N. about	1728	By the Engliſh.
Carolina, S.	1669	By Gov. Sayle.
Connecticut,	1635	By Mr. Fenwick, at Saybrook.
Delaware,	1627	By the Swedes & Fins.
Georgia,	1732	By Gen. Oglethorpe.
Kentucky,	1773	By Col. Daniel Boon.
Maryland,	1633	By Lord Baltimore.
Maſſachuſett's Bay,	1628	By Capt. John Endicot, and Co.
Newfoundland,	1610	By Gov. John Guy.
New-Hampſhire,	1623	By the Engliſh.
New Jerſey,	1616	By the Dutch.
	1664	By the Engliſh.
New York, about	1616	By the Dutch.
Pennſylvania,	1627	By the Swedes & Fins.
	1682	By William Penn.
Plymouth,	1620	By part of Mr. Robinſon's congregation.
Quebec,	1608	By the French.
Rhode Iſland,	1637	By Mr. Roger Williams, and his perſecuted brethren.
Tenneſſee,	1783	By emigrants from all parts of the union.
Territory North Weſt of Ohio river,	1787	By the Ohio & other companies.
Vermont,	1777	By emigrants from Connecticut and other parts of New England.
Virginia,	1609	By Lord De la War.

Previous to the year 1776, by far the greateſt part of theſe territories belonged to Great Britain, whoſe colonies in North-America extended ſo far as to render it difficult to aſcertain their preciſe boundaries. To the northward, they might have extended their claims quite to the pole itſelf; nor did any nation ſeem inclined to doubt their pretenſions. From that extremity, they had a territory extending ſouthward to Cape Florida, in the gulph of Mexico, in N. Lat. 25. and conſequently near 4000 miles long in a direct line. And to the weſtward their boundaries reached to nations unknown even to the Indians of Canada. Of the revolution that has ſince taken place, by which a great part of thoſe territories have been torn from the Britiſh empire, the hiſtory follows in the next article.

AMERICA, ESTABLISHMENT OF THE UNITED STATES OF. Of the riſe and eſtabliſhment of this republic, which has given a new face the Weſtern World, a ſuccinct and impartial narrative ſhall be attempted under this article. At the concluſion of the war between Great Britain and France, in 1763, the Britiſh colonies of North America were in a high ſtate of political proſperity. Their population, commerce and wealth, advanced with a rapid pace. Their internal government was conducted with a degree of ſteadineſs, frugality and wiſdom, which have been ſeldom or never equalled. During that war, the fleets of Britain had planted the ſtandard of victory over all the ſeas, and her conqueſts had enlarged her dominions, with an immenſe territory in both the Indies. Such a ſudden increaſe gave her in the eyes of the world, a ſplendour, which excited envy and admiration: but within herſelf ſhe was reduced to grieve at her own triumphs. Cruſhed with a load of debt, amounting to the enormous ſum of $ 648,852,500. which coſt her an intereſt of $ 21,673,928. ſhe was with difficult, able to ſupport the current expences of the ſtate, with the revenue of $ 42,620,000. and that revenue far from increaſing, was not even ſure of continuance.

In conſequence of this ſituation of affairs, the taxes in Great-Britain, began to be greatly increaſed; lands and houſes were charged with a higher tax than they had ever been heretofore: new duties were alſo laid on windows, and beer and cider, the drink of the common people, likewiſe, became objects of taxation. In ſhort, every ſpring was ſtrained, every power of the body politic was extended to the utmoſt ſtretch.—The criſis was a violent one. It was time to give the people ſome relief; but how could this be effected. They could not be eaſed by a diminution of expences, theſe being inevitable. The Britiſh miniſters, therefore, after ſome conſideration, thought of the expedient of calling in the American colonies to the aid of the mother country, by making them bear a part of this burden. Accordingly, in March 1764, a bill was paſſed, by which heavy duties were laid on goods imported by the coloniſts from ſuch Weſt-India iſlands as did not belong to Great-Britain, and the duties were to be paid into the exchequer in ſpecie. In the ſame ſeſſion, another bill was framed, to reſtrain the currency of paper money in the colonies. Theſe acts coming ſo cloſe upon each other, threw the whole continent into the utmoſt ferment. Vehement remonſtrances were made to the miniſtry, and every argument made uſe of that reaſon or ingenuity could ſuggeſt, but to no purpoſe. Their reaſoning, however, convinced a great number of people at home; and thus the American cauſe came to be conſidered as the cauſe of liberty. The Americans, finding all argumentation vain, at laſt united in an agreement to import no more of the manufactures of Great-Britain, but to encourage to the utmoſt of their power every thing of that kind among themſelves. Thus the Britiſh manufactures alſo became a party againſt miniſtry, and did not fail to expreſs their reſentment in the ſtrongeſt terms; but the miniſtry were not to be ſo eaſy daunted, and therefore proceeded to the laſt ſtep of their intended plan, which was to lay on ſtamp duties throughout the continent. Previous to this, indeed, ſeveral regulations were paſſed in favour of the commerce of the colonies; but they had now imbided ſuch unfavourable ſentiments of the Britiſh miniſtry, that they paid very little regard to any thing pretended to be done in their favour; or if theſe acts made any favourable impreſſion, it was quickly obliterated by the news of the ſtamp act. The reaſon given for this act was, that a ſum might be raiſed ſufficient for the defence of the colonies againſt a foreign enemy; but this pretence was ſo far from giving ſatisfaction to the Americans, that it excited their indignation to the utmoſt degree. They not only aſſerted, that they were abundantly able to defend themſelves againſt any foreign enemy, but denied that the Britiſh parliament had any right to tax them at all. It would be ſuperfluous to detail the arguments uſed by the contending parties on this occaſion. The matter was not to be decided by argument, but by arms; and the Britiſh miniſtry, too confident of the power of England, determined to carry matters with a high hand, to terrify the coloniſts into an implicit ſubjection, or, if that would not do, to compel them to it by force. The ſtamp act, after a violent oppoſition in parliament was paſſed, and its reception in America was ſuch as might have been expected. As ſoon as it arrived at Boſton, the bells were muffled, and rung a funeral peal. It was hawked about the ſtreets with a Death's head affixed to it, and ſtyled the *Folly of England, and the Ruin of America;* and afterwards publicly burnt by the enraged populace. The ſtamps themſelves were ſeized and deſtroyed, unleſs kept in fortified places; thoſe who were to receive the ſtamp duties were compelled to reſign their offices; and ſuch of the Americans as ſided with government, had their houſes plundered and burnt, and when perſonally laid hold of, were tarred and feathered. The doctrine became general and openly avowed, that Britain had no right whatever to tax the colonies without their conſent.—It was now abſolutely neceſſary either to yield to the Americans, by repealing the obnoxious ſtatutes, or to enforce them by arms. The ferment had diffuſed itſelf univerſally throughout the colonies. Virginia firſt, and after that all the reſt of the provinces, declared againſt the right of Britain to lay on taxes in America, and that every attempt to veſt others with this power beſides the king, or the governor of the province and his general aſſembly, was unconſtitutional and unjuſt. Non-importation agreements were every where entered into; and it was even reſolved to prevent the ſale of any more Britiſh goods. American manufactures, though dearer, as well as inferior in quality to the Britiſh, were univerſally preferred. An aſſociation was entered into againſt eating lamb, to promote the growth of wool; and the ladies agreed to renounce the uſe of every ſpecies of ornament manufactured in Britain. Such a general confederacy determined the miniſtry to repeal ſome of the moſt obnoxious ſtatutes; and to this they were the more inclined, by a petition from the firſt American congreſs, held at New-York, in the begining of October, 1765.—The ſtamp act was therefore repealed, to the univerſal joy of the Americans, and indeed to the general ſatisfaction of the Engliſh, whoſe manufacturers had begun to ſuffer in conſequence of the American aſſociation againſt them. The diſputes on the ſubject without doors, however, were by no means ſilenced, but each party continued to argue the caſe as violently as ever. The celebrated Dr. Benjamin Franklin was, on this occaſion, examined before the Houſe of Commons, and his opinion was, "That the tax was impracticable and ruinous; that the very attempt had ſo far alienated the affection of the colonies, that they behaved in a leſs friendly manner towards the natives of England than before; conſidering the nation as conſpiring againſt their liberty, and the parliament as willing rather to oppreſs than to aſſiſt them: That the Americans had been greatly miſrepreſented, as void of gratitude to the parent ſtate; than which nothing could be more contrary to truth: That in the war of 1755, they had, at their own expence, raiſed an army of 25,000 men; and in that of 1739, they aſſiſted the Britiſh expeditions againſt S. America with ſeveral thouſand men, and had made many brave exertions againſt the French in North America: And that they would ſtill continue to act with their uſual fidelity, and never fail to manifeſt their readineſs in contributing to the emergencies of government, when called to do ſo in a regular and conſtitutional manner."—The miniſtry were conſcious, that in repealing this obnoxious act, they yielded to the Americans; and therefore, to ſupport, as they thought, the dignity of Great-Britain, it was judged proper to publiſh a declaratory bill, ſetting forth the authority of the mother country over her colonies, and her power to bind them by laws and ſtatutes *in all caſes whatever.* This much diminiſhed the joy with which the repeal of the ſtamp act was received in America. It was conſidered as a proper reaſon to enforce any claim equally prejudicial with the ſtamp act, which might hereafter be ſet up; a ſpirit of jealouſy pervaded the whole continent, and a ſtrong party was formed, watchful on every occaſion to guard againſt the encroachments of the Britiſh power. It was not long before an occaſion offered, in which the Americans manifeſted a ſpirit of abſolute independency; and that, inſtead of being bound by the Britiſh legiſlature in all caſes, they would not be controuled by it in the moſt trivial affairs. The Rockingham miniſtry had paſſed an act, providing the troops ſtationed in different parts of the colonies with ſuch accommodations as were neceſſary. The aſſembly of New-York, however, altered the mode of execution preſcribed by the act, and ſubſtituted one of their own. This gave great offence to the new miniſtry, and rendered them, though compoſed of thoſe who had been active againſt the ſtamp bill, leſs favourable to the coloniſts than in all probability they would otherwiſe have been. An unlucky circumſtance at the ſame time occurred, which threw every thing once more into confuſion. One of the new miniſtry, Mr. Charles Townſhend, having declared that he could find a way of taxing the Americans without giving them offence, was called upon to propoſe his plan. This was by impoſing a duty upon tea, papers, painters colours, and glaſs imported into America. The undaunted behavior of the New-York aſſembly, and that of Boſton, which had proceeded in a ſimilar manner, cauſed this bill to meet with leſs oppoſition than otherwiſe it might have done. As a puniſhment to the refractory aſſemblies, the legiſlative power was taken from that of New-York, until it ſhould fully comply with the terms of the act. That of Boſton at laſt ſubmitted with reluctance. The bill for the new taxes was quickly paſſed and ſent to America in 1768.—A ferment much greater than that occaſioned by the ſtamp act now took place throughout the continent. The populace renewed their outrages, and thoſe of ſuperior ſtation entered into regular combinations againſt it. Circular letters were ſent from Maſſachuſetts colony to all the reſt, ſetting forth the injuſtice and impropriety of the behavior of the Britiſh legiſlature. Meetings were held in all the principal towns in which it was propoſed to leſſen rhe conſumption of foreign manufactures by giving due encouragement to their own. Continual diſputes enſued betwixt the governors and general aſſemblies of their provinces, which were much heightened by a letter from Lord Shelburn to Governor Bamund of Maſſachuſetts Bay, containing complaints of the people he governed. The aſſembly, exaſperated to the higheſt degree, charged their governor with having miſrepreſented them to the Court of Britain, required him to produce copies of the letters he had ſent; and, on his refuſal, wrote letters to the Engliſh miniſtry, accuſing him of miſrepreſentation and partiality, complaining at the ſame time of the proceedings of Parliament, as utterly ſubverſive of the liberties of America, and the rights of Britiſh ſubjects. The governor, at a loſs how to defend himſelf, prorogued the aſſembly; and, in his ſpeech on the occaſion, gave a looſe to his reſentment, accuſing the members of ambitious deſigns, incompatible with thoſe of dutiful and loyal ſubjects. To counteract the circular letter of the province of Maſſachuſetts Bay, Lord Hillſborough, ſecretary for the American department, ſent another to the governors of the different colonies, reprobating the other as full of miſrepreſentation, and tending to excite a rebellion againſt the authority of the parent ſtate. Matters now haſtened to a criſis. The governor required the aſſembly to reſcind that reſolution by which they had written their circular letter, which they refuſed; and in their reply to Lord Hillſborough accuſed him, and petitioned for his removal. Theſe proceedings were followed by a violent tumult at Boſton. A veſſel belonging to a capital trader had been ſeized in conſequence of his having neglected ſome of the new regulations; and being taken under the protection of a man of war, at that time lying in the harbour, the populace attacked the houſes of the commiſſioners of exciſe, broke their windows, deſtroyed the collector's boats, and obliged the cuſtom-houſe officers to take ſhelter in Caſtle-William, ſituated at the entrance of the harbour. The governor now took the laſt ſtep in his power to put a ſtop to the violent proceedings of his aſſembly, by diſſolving it entirely; but this was of little moment. Their behaviour had been highly approved by the other colonies. After the diſſolution of the aſſembly, frequent meetings of the people were held in Boſton, which ended in a remonſtrance to the governor, to the ſame purpoſe as ſome of the former; but concluding with an extraordinary requeſt, that he would take upon him to order the King's ſhips out of the harbor. Such was the diſpoſition of the Boſtonians, when the news arrived that the agent of the colony had not been allowed to deliver their petition to the King; it having been objected, that the aſſembly without the governor was not ſufficient authority. This increaſed the ferment; which was farther augmented by the news that a number of troops had been ordered to repair to Boſton, to keep the inhabitants in awe. The people called on the governor to convene a general aſſembly, in order to remove their fears of the military; who, they ſaid, were to be aſſembled to overthrow their liberties. The governor replied, that it was no longer in his power to call an aſſembly; having, in his laſt inſtructions from England, been required to wait the King's orders. Being thus refuſed, the people took upon themſelves the formation of an aſſembly, which they called a *convention:* whoſe proceedings and reſolutions were conformable to their former behavior. They went a ſtep farther, and under pretence of an approaching rupture with France, ordered the inhabitants to put themſelves in a poſture of defence againſt any ſudden attack of an enemy; and circular letters were directed to all the towns in the province, acquainting them with the reſolutions that had been taken in the capitol, and exhorting them to proceed in the ſame manner. The convention, however, aſſured the governor of their pacific intentions, and renewed their requeſt that an aſſembly might be called; but being refuſed any audience, and threatened with being treated as rebels, they at length diſſolved of themſelves, and ſent over to Britain a circumſtantial account of their proceedings, with the reaſons of their having aſſembled. The expected troops arrived on the very day on which the convention broke up, and had ſome houſes in town fitted up for their reception.—Their arrival had a conſiderable influence on the people, and for ſome time ſeemed to put a ſtop to the diſturbances; but the ſeeds of diſcord had now taken ſuch deep root, that it was impoſſible to eradicate them. Indeed ſome circumſtances, which occurred ſoon after, greatly contributed to encreaſe them. On the 5th of March, 1770, a ſcuffle happened between ſome ſoldiers, and a party of the town's people. The inhabitants poured in from all quarters to the aſſiſtance of their fellow citizens; a violent tumult enſued, during which the military fired, killing and wounding ſeveral of them. The whole province now roſe in arms, and the ſoldiers were obliged to retire to Caſtle Williams, to prevent being cut in pieces. Government at laſt, determined to act with vigour, and at the ſame time aſſumed an appearance of moderation, by repealing all the duties except that on tea. This was left on purpoſe to maintain the dignity of the crown; and it was thought that it could not be productive of any diſcontent in America, as being an affair of very little moment, the produce of which was not expected to exceed £16,000 ſterling, or $71,040. The oppoſitioniſts, however, were ſtrenuous in their endeavours to get this tax, likewiſe abrogated: inſiſting, that the Americans would conſider it only as an inlet to others; and that the repeal of all the reſt without this, would anſwer no good purpoſe. The event ſhewed that their opinion was well founded. The Americans oppoſed the tax with the ſame violence as they had done all the reſt: and at laſt, on the news that ſalaries had been ſettled on the juſtices of the ſuperior court of Boſton, the governor was addreſſed on the ſubject; the meaſure was condemned in the ſtrongeſt terms; and a committe appointed to inquire into it. The new aſſembly diſavowed the ſupremacy of the Britiſh legiſlature, and accuſed the Parliament of having violated the rights of the Americans in a number of inſtances. Copies of the tranſactions of this aſſembly were tranſmitted to every town in Maſſachuſetts, exhorting the inhabitants to rouſe themſelves, and to exert every nerve againſt the oppreſſion with which they were threatened. The diſturbances were alſo greatly heightened by the accidental diſcovery that Mr. Hutchinſon, governor of Maſſachuſett's Bay, had written ſeveral confidential letters to people in power in England, complaining of the behaviour of the province, recommending vigorous meaſures againſt them, and, among other things, aſſerting, that "there muſt be an abridgment of what is called *Britiſh liberty*." Letters of this kind had ſome how fallen into the hands of the agent for the colony at London. They were immediately tranſmitted to Boſton, where the aſſembly was ſitting, by whom they were laid before the governor, who was thus reduced to a very mortifying ſituation. Loſing every idea of reſpect for him as governor, they inſtantly diſpatched a petition to the king, requeſting him to remove the governor and deputy-governor from their places; but to this they not only received no favourable anſwer, but the petition itſelf was declared groundleſs and ſcandalous. Matters were now ripe for the utmoſt extremities on the part of the Americans. Though the coloniſts had entered into a non-importation agreement againſt tea, as well as other commodities from Britain, it had nevertheleſs found its way into America, though in ſmaller quantities than before. This was ſenſibly felt by the Eaſt India Company, who had now agreed to pay a large ſum annually to government; in recompence for which compliance, and to make up their loſſes in other reſpects, they were empowered to export their tea free from any duty payable in Britain; and in conſequence of this permiſſion, ſeveral ſhips freighted with the commodity were ſent to North America, and proper agents appointed for diſpoſing of it. The Americans perceiving that the tax was thus likely to be enforced, determined to take every poſſible method to prevent the tea from being landed, knowing that it would be impoſſible to hinder the ſale, ſhould the commodity once be brought on ſhore. For this purpoſe the people aſſembled in great numbers, forcing thoſe to whom the tea was conſigned to reſign their offices, and to promiſe ſolemnly never to reſume them; and committees were appointed to examine the accounts of merchants, and make public teſts, declaring ſuch as would not take them enemies to their country. Nor was this behaviour confined to the colony of Maſſachuſett's Bay; the reſt of the provinces entered into the conteſt with the ſame warmth, and manifeſted the ſame reſolution to oppoſe the mother country. Mean time three ſhips laden with tea arrived at Boſton; but ſo much were the captains alarmed at the diſpoſition which prevailed among the people, that they offered, provided they could obtain the proper diſcharges, from the conſignees, cuſtom-houſe, and governor, to return to Britain without landing their cargoes. The parties concerned, however, though they durſt not order the tea to be landed, refuſed to grant the diſcharges. The ſhips, therefore, would have been obliged to remain in the harbour; but the people, apprehenſive that, if they remained there, the tea would be landed in ſmall quantities, and diſpoſed of in ſpite of every endeavour to prevent it, reſolved to deſtroy it at once. This reſolution was executed with equal ſpeed and ſecrecy. The evening after theſe diſcharges had been refuſed, a number of people dreſſed like Mohawk Indians, boarded the ſhips, and threw into the ſea their whole cargoes, conſiſting of 342 cheſts of tea; after which they retired without doing any more damage. No tea was deſtroyed in other places, though the ſame ſpirit was every where manifeſted. At Philadelphia the pilots were enjoined not to conduct the veſſels up the river; and at New-York, though the governor cauſed ſome tea to be landed under the protection of a man of war, he was obliged to deliver it up to the cuſtody of the people, to prevent its being ſold. The deſtruction of the tea at Boſton, which happened in November 1773, was the immediate prelude to the diſaſters attending civil diſcord. Government finding themſelves every where inſulted and deſpiſed, reſolved to enforce their authority; and as Boſton had been the principal ſcene of the riots and outrages, it was determined to puniſh that city in an exemplary manner. It was propoſed to lay a fine on the town of Boſton, equal to the price of the tea which had been deſtroyed, and to ſhut up its ports by armed veſſels until the refractory ſpirit of the inhabitants ſhould be ſubdued. The bill was ſtrongly oppoſed on the ſame grounds that the other had been; and it was predicted, that inſtead of having any tendency to ſubdue the Americans, it would infallibly exaſperate them beyond any poſſibility of reconciliation. The petitions againſt it, preſented by the colony's agent, pointed out the ſame conſequence in the ſtrongeſt terms, and declared that the Americans never would ſubmit to it; but ſuch was the general infatuation, that it was never believed the Americans would dare to reſiſt the parent ſtate openly, but would in the end ſubmit implicitly to her commands. In this confidence a third bill was propoſed, by which it was provided, that ſhould any perſons employed in ſuppreſſing riots, be indicted for murder, and not able to obtain a fair trial in the province, they might be ſent by the governor to England, or to ſome other colony, if neceſſary, to be tried for the ſuppoſed crime. Theſe bills having paſſed ſo eaſily, the miniſtry propoſed a fourth, relative to the government of Canada, by which the extent of that province was greatly enlarged; its affairs put under the direction of a council in which Roman Catholics were to be admitted; the Roman Catholic clergy were ſecured in their poſſeſſions, and the uſual perquiſites from thoſe of their own profeſſion. The council were to be appointed by the Crown; to be removable at his pleaſure; and to be inveſted with every legiſlative power, excepting that of taxation. No ſooner were theſe laws made known in America, than they cemented the union of the colonies beyond any poſſibility of diſſolving it. The aſſembly of Maſſachuſett's Bay had paſſed a vote againſt the judges accepting ſalaries from the Crown, and put the queſtion, Whether they would accept them as uſual from the general aſſembly? Four anſwered in the affirmative; but Peter Oliver, the chief juſtice, refuſed. A petition againſt him, and an accuſation, were brought before the governor, who refuſed to interfere in the matter; but as they ſtill inſiſted for juſtice againſt Oliver, the governor put an end to it, by diſſolving the aſſembly. In this ſituation of affairs, a new alarm was occaſioned by the news of the port-bill, which was totally unexpected, and was received with the moſt extravagant expreſſions of diſpleaſure; and while theſe continued, the new governor, general Gage, arrived from England. The firſt act of his office, as governor, was to remove the aſſembly to Salem, a town 17 miles diſtant, in conſequence of the late act. When this was intimated to the aſſembly, they replied by requeſting him to appoint a day of public humiliation for deprecating the wrath of heaven, but met with a refuſal. When they met at Salem, they paſſed a reſolution, declaring the neceſſity of a general congreſs, compoſed of delegates from all the provinces, in order to take the affairs of the colonies at large into conſideration; and five gentlemen, remarkable for their oppoſition to the Britiſh meaſures, were choſen to repreſent that of Maſſachuſett's Bay. They then proceeded with all expedition to draw up a declaration, containing a detail of the grievances they laboured under, and the neceſſity of exerting themſelves againſt lawleſs power; they ſet forth the diſregard ſhewn to their petitions, and the attempts of G. Britain to deſtroy their ancient conſtitution; and concluded with exhorting the inhabitants of the colony to obſtruct, by every method in their power, ſuch evil deſigns, recommending at the ſame time a total renunciation of every thing imported from G. Britain till a redreſs of grievances could be procured. Intelligence of this declaration was carried to the governor on the very day it was completed; on which he diſſolved the aſſembly. It had been expected by the miniſterial party at home, that the advantages which other towns of the colony might derive from the annihilation of the trade of Boſton, would make them readily acquieſce in the meaſure of ſhutting up that port and rather rejoice in it than otherwiſe; but ſubſequent tranſactions ſoon manifeſted all hope of this kind to be totally vain.

No ſooner did intelligence arrive of the remaining bills paſſed in the ſeſſion of 1774, then the cauſe of Boſton became the cauſe of all the colonies. The port-bill had already occaſioned violent commotions throughout them all. It had been reprobated in provincial meetings, and reſiſtance even to the laſt had been recommended againſt ſuch oppreſſion. In Virginia, the firſt of June, (the day on which the port of Boſton was to be ſhut up,) was held as day of humiliation, and a public interceſſion in favour of America was enjoined. The prayer enjoined at this time was, that "God would give the people one heart and one mind, firmly to oppoſe every invaſion of the American rights." The Virginians, however, did not content themſelves with acts of religion. They recommended a general congreſs of all the colonies, being perſuaded that an attempt to tax any colony, in an arbitrary manner, was in reality an attack upon them all. The provinces of New-York and Pennſylvania, however, were leſs ſanguine than the reſt, being ſo cloſely connected in the way of trade with Great-Britain, that the giving it up entirely appeared a [illegible]er of the moſt ſerious magnitude, and not to be thought of but after every other method had failed. The intelligence of the remaining bill reſpecting Boſton, however, ſpread a freſh alarm throughout the continent, and fixed thoſe who had ſeemed to be the moſt wavering. The propoſal of giving up all commercial intercourſe with Britain was again propoſed [illegible]ns for the inhabitants of Boſton were raiſ[illegible] quarter; and they every day received addreſſ[illegible]mmending them for the heroic courage with which they ſuſtained their calamity. The Boſtonians on their [illegible]ing in their endeavours to prom[illegible] An agreement was framed, which, in imitation of former times they called a *Solemn League and Covenant*. By this the ſubſcribers bound themſelves to break off all communication with Britain, after the expiration of the month of Auguſt, until the obnoxious acts were repealed; they engaged neither to purchaſe nor uſe any goods imported after that time, and to renounce all connection with thoſe who did, or who refuſed to ſubſcribe to this covenant, threatening to publiſh the names of the refractory, which at this time was a puniſhment by no means to be deſpiſed. Agreements of a ſimilar kind were almoſt inſtantaneouſly entered into throughout all America. Gen. Gage indeed attempted to counteract the covenant by a proclamation, wherein it was declared an illegal and traitorous combination, threatening with the pains of law ſuch as ſubſcribed or countenanced it. But matters were too far gone for his proclamation to have any effect. Preparations were now made for holding the general congreſs ſo often propoſed, and Philadelphia, as being the moſt centrical town, was pitched upon for the place of its meeting. The delegates were choſen by the repreſentatives of each province, and were in number from two to ſeven for each colony, though no province had more than one vote. The firſt congreſs which met at Philadelphia, in the beginning of Sep. 1774, conſiſted of 51 delegates. The novelty and importance of the meeting excited an univerſal attention; and their tranſactions were ſuch as could not but tend to render them reſpectable.

The firſt act of congreſs was an approbation of the conduct of Maſſachuſett's Bay, and an exhortation to continue in the ſame ſpirit with which they had begun. Supplies for the ſuffering inhabitants, (whom indeed the operation of the port-bill had reduced to great diſtreſs,) were ſtrongly recommended; and it was declared, that in caſe of attempts to enforce the obnoxious acts by arms, all America ſhould join to aſſiſt the town of Boſton; and ſhould the inhabitants be obliged, during the courſe of hoſtilities, to remove further up the country, the loſſes they might ſuſtain ſhould be repaired at the public expence. They next addreſſed General Gage by letter; in which, having ſtated the grievances of the people of Maſſachuſetts's colony, they informed him of the fixed determination of all the other provinces to ſupport their brethren and to oppoſe the Britiſh acts of parliament; that they themſelves were appointed to watch over the liberties of America; and intreated him to deſiſt from military operations, leſt ſuch hoſtilities might be brought on, as would fruſtrate all hopes of reconciliation with the parent ſtate. They next publiſhed a declaration of their rights. Theſe they ſtated as the rights belonging to Engliſhmen; and inſiſted, that as their diſtance rendered it impoſſible for them to be repreſented in the Britiſh parliament, their provincial aſſemblies, with the governor appointed by the king, conſtituted the only legiſlative power within each province. They would, however, conſent to ſuch acts of parliament as were calculated merely for the regulation of commerce, and ſecuring to the parent ſtate the benefits of the American trade; but would never allow that they could impoſe any tax on the colonies, for raiſing a revenue, without their conſent. They reprobated the intention of the new acts of parliament; and inſiſted on all the rights enumerated as unalienable, and what none could deprive them of. They declared in favor of a non-importation and non-conſumption of Britiſh goods, until the acts impoſing duties on teas, &c. were repealed, as well as the Boſton port-act, and the three others paſſed in the preceding ſeſſion of parliament. New regulations, againſt the importation and conſumption of Britiſh commodities, were drawn up with great ſolemnity: and they concluded with returning the warmeſt thanks to thoſe members of parliament who had with ſo much zeal, though without ſucceſs, oppoſed the obnoxious acts. They next drew up a petition to the king, an addreſs to the Britiſh nation, and another to the colonies; all of which were drawn up in a maſterly manner, and ought to have impreſſed the people of Great-Britain with a more favourable idea of the Americans than they at that time entertained. Theſe proceedings were entirely agreeable to the people. The firſt of June had been kept as a faſt, not only throughout Virginia, where it was firſt propoſed, but through the whole continent. Contributions for the diſtreſſes of Boſton had been raiſed throughout America, and people of all ranks ſeemed to be affected with them. Even thoſe who ſeemed to be moſt likely to derive advantages from them took no opportunity. Mean time the Britiſh forces at Boſton were continually increaſing in number, which greatly augmented the general jealouſy and diſaffection. The people, however, far from being intimidated, continued to manifeſt their inflexible determination to adhere to the plan they had ſo long followed. Every where they manifeſted the moſt ardent deſire of learning the art of war; and every individual who could bear arms, was aſſiduous in procuring them, and learning their exerciſe. At laſt General Gage thought proper to fortify the neck of land which joins the town of Boſton to the continent. This, though undoubtedly a prudent meaſure in his ſituation, was exclaimed againſt by the Americans in the moſt vehement manner; but the general, inſtead of giving ear to their remonſtrances, deprived them of all power of acting againſt himſelf, by ſeizing the provincial powder, ammunition, and military ſtores at Cambridge and Charleſtown. This excited ſuch indignation, that it was with the utmoſt difficulty the people could be reſtrained from marching to Boſton and attacking the troops. In the mean time a meeting was held of the principal inhabitants of the towns adjacent to Boſton, who publicly renounced all obedience to the late acts of parliament, and formed an engagement to indemnify ſuch as ſhould be proſecuted on that account; all ranks and degrees were exhorted to learn the uſe of arms; and the receivers of the public revenue were ordered not to deliver it into the treaſury, but retain it in their own hands till the conſtitution ſhould be reſtored, or a provincial Congreſs diſpoſe of it otherwiſe. A remonſtrance againſt the fortifications on Boſton Neck was prepared; in which, however, they ſtill declared their unwillingneſs to proceed to any hoſtile meaſures; aſſerting only their firm determination not to ſubmit to the acts of parliament they had already ſo much complained of. The governor, to reſtore tranquility, if poſſible, called a general aſſembly; but ſo many of the council had reſigned their ſeats, that he was induced to countermand its ſitting by proclamation. This meaſure, however was deemed illegal; the aſſembly met at Salem; and after waiting a day for the governor, voted themſelves into a provincial congreſs, of which the celebrated Mr. John Hancock was choſen preſident. A committee was inſtantly appointed, who waited for the governor with a remonſtrance concerning the fortifications on Boſton Neck, but nothing of conſequence took place, both parties mutually criminating each other. The winter was now coming on, and the governor, to avoid quartering the ſoldiers upon the inhabitants, propoſed to erect barracks for them; but the ſelect men of Boſton compelled the workmen to deſiſt. Carpenters were ſent for from New-York, but they were refuſed; and it was with the utmoſt difficulty that he could procure winter lodgings for his troops. Nor was the difficulty leſs in procuring clothes; as the merchants of New-York told him, that "they would never ſupply any article for the benefit of men ſent as enemies to their country." This diſpoſition, known to be almoſt univerſal throughout the continent, was in the higheſt degree ſatisfactory to the congreſs. Every one ſaw that the enſuing ſpring was to be the ſeaſon of commencing hiſtilities, and the moſt indefatigable diligence was uſed by the colonies to be well provided againſt ſuch a formidable enemy. Liſts of all the fencible men was made out, magazines of arms were collected, and money was provided for the payment of troops. The governors attempted to put a ſtop to theſe proceedings by proclamations; but matters had now proceeded ſo far as to render proclamation of no effect. The Americans therefore, without ceremony, began to ſeize on the military ſtores and ammunition belonging to government. This firſt commenced at Newport in Rhode-Iſland, where the inhabitants carried off 40 pieces of cannon appointed for the protection of the place; and on being aſked the reaſon of this proceeding, they replied that the people had ſeized them leſt they ſhould be made uſe of againſt themſelves. After this the aſſembly met, and reſolved that ammunition and warlike ſtores ſhould be purchaſed with the public money. New Hampſhire followed the example of Rhode-Iſland, and ſeized a ſmall fort for the ſake of the powder and military ſtores it contained. In Pennſylvania, however, a convention was held, which expreſſed an earneſt deſire of reconciliation with the mother country; though, at the ſame time, in the ſtrongeſt manner declaring, that they were reſolved to take up arms in defence of their juſt rights, and defend to the laſt their oppoſition to the late acts of parliament; and the people were exhorted to apply themſelves with the greateſt aſſiduity to the proſecution of ſuch manufactures as were neceſſary for their defence and ſubſiſtence, ſuch as ſalt, ſalt-petre, gunpowder, ſteel, &c. This was the univerſal voice of the colonies, New York only excepted. The aſſembly of that province, as yet, ignorant of the fate of their laſt remonſtrance, refuſed to concur with the other colonies in their determination to throw off the Britiſh yoke: their attachment, however, was very faint, and by the event it appeared that a perſeverance in the meaſures which the miniſtry had adopted was ſufficient to unite them to the reſt.

As the diſturbances which gave riſe to the American war, had originated in the province of Maſſachuſett's Bay, and continued there all along with the greateſt violence, ſo this was the province where the firſt hoſtilities were formally commenced. In the beginning of February 1776, the provincial congreſs met at Cambridge: and as no friends to Britain could now find admittance to that aſſembly, the only conſideration was how to make proper preparations for war. Expertneſs in military diſcipline was recommended in the ſtrongeſt manner, and ſeveral military inſtitutions enacted; among which that of the *minute men* was one of the moſt remarkable. Theſe were choſen from the moſt active and expert among the militia; and their buſineſs was to keep themſelves in conſtant readineſs at the call of their officers; from which perpetual vigilence they derived their title. It was now eaſily ſeen, that a ſlight occaſion would bring on hoſtilities; for both parties were ſo much exaſperated by a long courſe of reproaches, that they were filled with the utmoſt inveteracy againſt each other. Whilſt things were in this ſituation, Gen. Gage having been informed, that a large quantity of ammunition and military ſtores had been collected at Concord, about 20 miles from Boſton, and where the provincial congreſs was ſitting, ſent a detachment to deſtroy the ſtores, and, as was reported, to ſeize ſome of the leading men of the congreſs. They ſet out before day break, on the 16th of April, marching with the utmoſt ſilence, and ſecuring every one they met on the road, that they might not be diſcovered. But notwithſtanding all their care, the continual ringing of bells and firing of guns as they went along ſoon gave them notice that the country was alarmed. About 5 in the morning they had reached Lexington, 15 miles from Boſton, where the militia were exerciſing. An officer called out to them to diſperſe; but ſome ſhots, it is ſaid, being at that moment fired from a houſe in the neighbourhood, the military made a diſcharge which killed and wounded ſeveral of the militia. The detachment then proceeded to Concord, where, having deſtroyed the ſtores, they were encountered by the Americans; and a ſcuffle enſued, in which ſeveral fell on both ſides. The purpoſe of their expedition being thus accompliſhed, it was neceſſary for the king's troops to retreat which they did through a continnal fire kept up on them from Concord to Lexington. Here their ammunition was totally expended; and they would have been unavoidably cut off, had they not been met by a conſiderable reinforcement commanded by Lord Percy. The Americans, however, continued their attack with great fury; and the Britiſh would ſtill have been in the utmoſt danger, had it not been for two field-pieces. which Lord Percy had brought with him. By theſe the impetuoſity of the Americans was checked, and the Britiſh made good their retreat to Boſton, with the loſs of 250 killed and wounded: that of the Americans was about 60. By this engagement the ſpirits of the Americans were ſo raiſed, that they meditated nothing leſs than the total expulſion of the Britiſh troops from Boſton. An army of 20,000 men was aſſembled, who formed a line of encampment from Roxbury to Myſtic, through a ſpace of about 40 miles; and here they were ſoon after joined by a large body of Connecticut troops, under Gen. Putnam, an old officer of great bravery and experience. By this formidable force was the town of Boſton now kept blocked up. General Gage, however, had ſo ſtrongly fortified it, that the enemy, powerful as they were, durſt not make an attack; while on the other hand, his force was by far to inſignificant to meet ſuch an enemy in the field. But towards the end of May, a conſiderable reinforcement having arrived, with Generals Howe, Burgoyne, and Clinton, he was ſoon enabled to attempt ſomething of conſequence; and this the boaſts of the provincials, that they were beſieging thoſe who had been ſent to ſubdue them, ſeemed to render neceſſary. Some ſkirmiſhes in the mean time happened in the iſlands lying off Boſton harbour, in which the Americans had the advantage. Nothing deciſive, however, took place till the 17th of June. In the neighbourhood of Charleſtown, a place on the northern ſhore of the peninſula on which Boſton ſtands, is an high ground commonly called *Bunker's Hill*, though properly *Breeds Hill*, which overlooks and commands the whole town of Boſton. In the night of the 16th the Americans took poſſeſſion of this place; and worked with ſuch indefatigable diligence, that, to the aſtoniſhment of their enemies, they had before day light almoſt completed a redoubt, with a ſtrong entrenchment reaching half a mile eaſtward, as far as the river Myſtic. After this they were obliged to ſuſtain a heavy and inceſſant fire from the ſhips and floating batteries with which Charleſtown Neck was ſurrounded, as well as the cannon that could reach the place from Boſton; in ſpite of which, however, they continued their work and finiſhed it before mid day. A conſiderable body of foot was then landed at the foot of Bunker's Hill, under the command of Generals How and Pigot; the former being appointed to attack the lines, and the latter the redoubt. The Americans, however, having the advantage of the ground, as well as of their entrenchments, poured down ſuch inceſſant volleys as threatened the whole body with deſtruction; and Gen. Howe was for a little time left almoſt alone, all his officers being killed or wounded. The Americans, in the mean time, had taken poſſeſſion of Charleſtown, ſo that Gen. Pigot was obliged to contend with them in that place as well as in the redoubt. The conſequence was, that he was overmatched;

his troops were thrown into diſorder ; and he would in all probability have been defeated, had not Gen. Clinton advanced to his relief : upon which the attack was renewed with ſuch fury, that the Americans were driven beyond the neck that leads to Charleſtown. In the heat of the engagement, the Britiſh troops were obliged to ſet fire to the town of Charleſtown, which quickly obliged the Americans to yield, after they were deprived of that ſhelter. The loſs on the Britiſh ſide, amounted to about 1000, among whom were 19 officers killed, and 70 wounded ; that of the Americans did not exceed 500. The Britiſh troops claimed the victory in this engagement, though they allowed that it was dearly bought ; but the Americans had the real advantage on their ſide, as they had ſo much weakened the enemy, that they durſt not afterwards venture out of their entrenchments. In other places, the ſame determined ſpirit of reſiſtance appeared on the part of the Americans. Lord North's conciliatory ſcheme was utterly rejected by the aſſemblies of Pennſylvania and New Jerſey, and afterwards in every other colony. The exportation of proviſions was every where prohibited, particularly to the Britiſh fiſhery on the banks of Newfoundland, or to ſuch colonies of America as ſhould adhere to the Britiſh intereſt. Congreſs reſolved on the eſtabliſhment of an army, and of a large paper currency in order to ſupport it. In the inland northern colonies, Colonels Eaſton and Ethan Allen, without receiving any orders from Congreſs, or communicating their deſign to any body, with a party of only 250 men, ſurpriſed the forts of Crown Point, Ticonderago, and the reſt that form a communication betwixt the colonies and Canada. On this occaſion, 200 pieces of cannon fell into their hands, beſides mortars and a large quantity of military ſtores, together with two armed veſſels, and materials for the conſtruction of others. After the battle of Bunker's Hill, the provincials erected fortifications on the heights which commanded Charleſtown, and ſtrengthened the reſt in ſuch a manner that there was no hope of driving them from thence ; at the ſame time that their activity and boldneſs aſtoniſhed the Britiſh officers, who had been accuſtomed to entertain too mean an opinion of their courage. The troops, then ſhut up in Boſton, were ſoon reduced to diſtreſs. Their neceſſities obliged them to attempt the carrying off the American cattle on the iſlands before Boſton, which produced frequent ſkirmiſhes ; but the provincials, better acquainted with the navigation of theſe ſhores, landed on the iſlands, deſtroyed or carried off whatever was of any uſe, burned the light houſe at the entrance of the harbour, and took priſoners the workmen ſent to repair it, as well as a party of marines who guarded them. Thus the garriſon were reduced to the neceſſity of ſending out armed veſſels to make prizes indiſcriminately of all that came in their way, and of landing in different places to plunder for ſubſiſtence as well as they could. The Congreſs in the mean time continued to act with all the vigour which its conſtituents had expected. Articles of confederation and perpetual union were drawn up and ſolemnly agreed upon ; by which they bound themſelves and their poſterity for ever. Theſe were in ſubſtance as follows :—1. Each colony was to be independent within itſelf, and to retain an abſolute foverignty in all domeſtic affairs. 2. Delegates to be annually elected to meet in Congreſs, at ſuch time and place as ſhould be enacted in the preceding Crongreſs. 3. This aſſembly ſhould have the power of determining war or peace, making alliances ; and in ſhort, all that power which ſovereigns of ſtates uſually claim as their own. 4. The expences of war to be paid out of the common treaſury, and raiſed by a poll tax on males between 16 and 60 ; the proportions to be determined by the laws of the colony. 5. An executive council to be appointed to act in place of the Congreſs during its receſs. 6. No colony to make war with the Indians without conſent of Congreſs. 7. The boundaries of all the Indian lands to be ſecured and aſcertained to them ; and no purchaſes of lands to be made by individuals, or even by a colony, without conſent of Congreſs. 8. Agents appointed by Congreſs ſhould reſide among the Indians, to prevent fruds in trading with them, and to relieve, at the public expence, their wants and diſtreſſes. 9. This confederation to laſt until there ſhould be a reconciliation with Britain ; or if that event ſhould not take place, it was to be perpetual. After the action of *Bunker's* Hill, however, when the power of Great Britain appeared leſs formidable in the eyes of America than before, Congreſs proceeded formally to juſtify their proceedings in a declaration drawn up in terms more expreſſive, and well calculated to excite attention. "Were it poſſible (ſaid they) for men who exerciſe their reaſon, to believe that the divine Author of our exiſtence intended a part of the human race to hold an abſolute property in an unbounded power over others, marked out by his infinite goodneſs and wiſdom as the object of a legal domination, never rightfully reſiſtible, however ſevere and oppreſſive ; the inhabitants of theſe colonies might at leaſt require from the parliament of Great Britain, ſome evidence that this dreadful authority over them had been granted to that body : but a reverence for our Great Creator, principles of humanity, and the dictates of common ſenſe, muſt convince all thoſe who reflect upon the ſubject, that government was inſtituted to promote the welfare of mankind, and ought to be adminiſtered for the attainment of that end. The legiſlature of Great Britain, however, ſtimulated by an inordinate paſſion for power, not only unjuſtifiable, but which they know to be peculiarly reprobated by the very conſtitution of that kingdom ; and deſpairing of ſucceſs, in any mode of conteſt, where regard ſhould be had to law, truth, or right ; have, at length, deſerting thoſe, attempted to effect their cruel and impolitic purpoſe of enſlaving theſe colonies by violence, and have thereby rendered it neceſſary for us to cloſe with their laſt appeal from reaſon to arms. Yet, however blinded that aſſembly may be, by their intemperate rage for unlimited domination, ſo to ſlight juſtice in the opinion of mankind, we eſteem ourſelves bound by the obligations to the reſt of the world to make known the juſtice of our cauſe." After taking notice of the manner in which their anceſtors left Britain, the happineſs attending the mutual friendly commerce betwixt that country and her colonies, and the remarkable ſucceſs of the late war, they complained of the Britiſh parliament, in the following terms :—"They have undertaken to give our money without our conſent, though we have ever exerciſed an excluſive right to diſpoſe of our own property. Statutes have been paſſed for extending the juriſdiction of the courts of admiralty and vice-admiralty, beyond their ancient limits; for depriving us of the accuſtomed and ineſtimable rights of the trial by jury. in caſes affecting both life and property; for ſuſpending the legiſlature of one of our colonies: for interdicting all commerce to the capital of another; and for altering fundamentally the form of government eſtabliſhed by charter, and ſecured by acts of its legiſlature; and ſolemnly confirmed by the crown; for exempting the murderers of coloniſts from legal trial, and in effect from puniſhment; for erecting in a neighbouring province, acquired by the joint arms of Great Britain and America, a deſpotiſm dangerous to our very exiſtence; and for quartering ſoldiers upon the coloniſts in time of a profound peace. It has alſo been reſolved in Parliament that coloniſts charged with committing certain offences, ſhall be tranſported to England to be tried. But why ſhould we enumerate our injuries in detail?—By one ſtatute it was declared, that parliament can of right make laws to bind us in *all cases whatever*. What is to defend us againſt ſo enormous, ſo unlimited a power? Not a ſingle perſon who aſſumes it is choſen by us, or is ſubject to our control or influence; but on the contrary, they are all of them exempt from the operation of ſuch laws; and an American revenue, would actually lighten their own burdens in proportion as it encreaſes ours. We ſaw the miſtery to which ſuch deſpotiſm would reduce us. We for ten years inceſſantly and ineffectually beſieged the throne as ſupplicants; we reaſoned, we remonſtrated with parliament in the moſt mild and decent language; but adminiſtration, ſenſible that we ſhould regard theſe meaſures as freemen ought to do, ſent over fleets and armies to enforce them. We have purſued every temperate, every reſpectful meaſure; we have even proceeded to break off all commercial intercourſe with our fellow ſubjects as our laſt peaceable admonition, that our attachment to no nation on earth would ſupplant our attachment to liberty: this we flattered ourſelves was the ultimate ſtep of the controverſy; but ſubſequent events have ſhewn how vain was this hope of finding moderation in our enemies! The commercial intercourſe of whole colonies with foreign countries has been cut off by one act of Parliament; by another, ſeveral of them were prohibited from the fiſheries in the ſeas near coaſts, on which they always depended for their ſubſiſtence; and large reinforcements of ſhips and troops were immediately ſent to Gengeral Gage. Fruitleſs were all the intreties, arguments, and eloquence of an illuſtrious band of the moſt diſtinguiſhed Peers aud Commoners, who nobly and ſtrenuouſly aſſerted the juſtice of our cauſe, to ſtay, or even to mitigate, the heedleſs fury with which theſe accumulated outrages were hurried on. Equally fruitleſs was the interference of the city of London, of Briſtol, and many other reſpectable towns in our favour." After having reproached Parliament, General Gage, and the Britiſh government in general, they proceeded thus: "We are reduced to the alternative of chooſing an unconditional ſubmiſſion to tyranny, or reſiſtance by force. The latter is our choice. We have counted the coſt of this conteſt, and find nothing ſo dreadful as voluntary ſlavery. Honour, juſtice, and humanity, forbid us tamely to ſurrender that feedom which we received from our gallant anceſtors, and which our innocent poſterity have a right to receive from us. Our cauſe is juſt; our union is perfect; our internal reſources are great; and, if neceſſary, foreign aſſiſtance is undoubtedly attainable. We fight not for glory or conqueſt; we exhibit to mankind the remarkable ſectacle of a people attacked by unprovoked enemies. They boaſt of their privileges and civilization, and yet proffer no milder conditions than ſervitude or death. In our own native land, in defence of the freedom that is our birthright, for the protection of our property acquired by the honeſt induſtry of our fore-fathers and our own, againſt violence actually offered, we have taken up arms; we ſhall lay them down when hoſtilities ſhall ceaſe on the part of our aggreſſors, and all danger of their being renewed ſhall be removed.—and not before." Theſe are ſome of the moſt ſtriking paſſages in the declaration of Congreſs on taking up arms againſt Great Britain, dated July 6th, 1775. In every other reſpect an equal ſpirit was ſhown; and the rulers of the Britiſh nation had the mortification to ſee thoſe whom they ſtyled *rebels* and *traitors*, ſucceed in negociations in which they themſelves were utterly foiled. By paſſing the Quebec bill, miniſtry had flattered themſelves that the Canadians would be ſo much attached to them for reſtoring the French laws, that they would very readily join in any attempt againſt the coloniſts who had reprobated that bill in ſuch ſtrong terms: but in this, as in every thing elſe indeed, they found themſelves miſtaken. The Canadians having been ſubject to Britain for a period of 15 years, and being thus rendered ſenſible of the ſuperior advantages of Britiſh government, received the bill itſelf with evident marks of diſapprobation; nay, reprobated it as tyrannical and oppreſſive.

A ſcheme had been formed for General Carleton, governor of the province, to raiſe an army of Canadians wherewith to act againſt the Americans; and ſo ſanguine were the hopes of the adminiſtration in this reſpect, that they ſent 20,000 ſtand of arms, and a great quantity of military ſtores to Quebec for the purpoſe. But the people, though they did not join the Americans, determined to ſtand neuter. The Britiſh adminiſtration next tried to engage the Indians in their cauſe. But though agents were diſperſed among them with large preſents to their chiefs, they univerſally replied, they did not underſtand the nature of the quarrel, nor could they diſtinguiſh whether thoſe who dwelt in America or on the other ſide of the ocean were in fault: but they were ſurpriſed to ſee Engliſhmen aſk their aſſiſtance againſt one another; and adviſed them to be reconciled, and not think of ſhedding the blood of their brethren. To the repreſentations of congreſs they paid more reſpect. Theſe ſet forth, that the Engliſh on the other ſide of the ocean had taken up arms to enſlave not only their countrymen in America, but the Indians alſo; and if the latter ſhould enable them to overcome the coloniſts, they themſelves would ſoon be reduced to a ſtate of ſlavery alſo. By arguments of this kind theſe ſavages were engaged to remain neuter; and thus the coloniſts were freed from a moſt dangerous enemy.

The other remarkable tranſactions of this congreſs were the ultimate refuſal of the conciliatory propoſal made by Lord North, of which ſuch ſanguine expectations had been formed by the Engliſh miniſtry; and appointing a generaliſſimo to command their armies, which were now very numerous. The perſon choſen for this purpoſe was the late illuſtrious and univerſally beloved George Waſhington: who was raiſed to this high ſtation by the unanimous voice of congreſs. Horace Gates and Charles Lee, two Engliſh officers of great reputation, were alſo choſen; the former an adjutant-general, the ſecond a major-general. Artemus Ward, Philip Schuyler, and Iſrael Putnam, were likewiſe nominated major-generals. Seth Pomeroy, Richard Montgomery, David Wooſter, William Heath, Joſeph Spencer, John Thomas, John Sullivan, and Nathaniel Green, were choſen brigadier-generals. Congreſs had now alſo the ſatisfaction to receive deputies from the colony of Georgia, expreſſing a deſire to join the confederacy. The ſucceſs which had hitherto attended the Americans in all their meaſures, now emboldened them to think of acting offenſively againſt Great-Britain. The conqueſt of Canada appeared an object within their reach, and one that would be attended with many advantages; and as an invaſion of that province was already facilitated by the taking of Crown Point and Ticonderoga, it was reſolved if poſſible to penetrate that way into Canada, and reduce Quebec during the winter, before the fleets and armies, which they were well aſſured would ſail thither from Britain, ſhould arrive. By order of Congreſs, therefore, 3000 men were put under the command of generals Montgomery and Schuyler, with orders to proceed to Lake Champlain, from whence they were to be conveyed, in flat-bottomed boats, to the mouth of the river Sorrel, a branch of the St. Lawrence, and on which is ſituated a fort of the ſame name. On the other hand, they were oppoſed by General Carleton, governor of Canada, a man of great activity and experience in war; who, with a very few troops, had hitherto been able to keep in awe the diſaffected people of Canada, notwithſtanding all the repreſentations of the coloniſts. He had now augmented his army by a conſiderable number of Indians, and promiſed, even in his preſent ſituation, to make a very formidable reſiſtance. As ſoon as General Montgomery arrived at Crown Point, he received information that ſeveral armed veſſels were ſtationed at St. John's, a ſtrong fort on the Sorrel, to prevent his croſſing the lake; on which he took poſſeſſion of an iſland which commands the mouth of the Sorrel, to prevent them from entering the lake. In conjunction with General Schuyler, he next proceeded to St. John's; but finding that place too ſtrong, he landed on a part of the country conſiderably diſtant, and full of woods and ſwamps. From thence, however, they were driven by a party of Indians whom General Carleton had employed. The American army was now obliged to retreat to the iſland of which they had at firſt taken poſſeſſion; where General Schuyler being taken ill, Montgomery was left to command alone. His firſt ſtep was to gain over the Indians whom General Carleton had employed, and this he in a great meaſure accompliſhed; after which, on receiving the full number of troops appointed for his expedition, he determined to lay ſiege to St. John's. In this he was facilitated by the reduction of Chamblee, a ſmall fort in the neighbourhood, where he found a large ſupply of powder. An attempt was made by General Carleton to relieve the place; for which purpoſe he collected about 1000 Canadians, while Colonel Maclean propoſed to raiſe a regiment of the Highlanders who had emigrated to America. But while General Carleton was on his march with theſe new levies, he was attacked by a ſuperior force of Americans, and defeated; which being made known to another body of Canadians who had joined Colonel Maclean, they abandoned him without ſtriking a blow, and he was obliged to retreat to Quebec. As the defeat of General Carleton, and the deſertion of Maclean's forces, left no room for the garriſon of St. John's to hope for any relief, they ſurrendered themſelves priſoners of war. They were in number 500 regulars and 200 Canadians, among whom were many of the French nobility, who had been very active in promoting the cauſe of Britain among their countrymen. General Montgomery next took meaſures to prevent the Britiſh ſhipping from paſſing down the river from Montreal to Quebec. This he accompliſhed ſo effectually, that the whole were taken. The town itſelf was obliged to ſurrender at diſcretion; and it was with the utmoſt difficulty that General Carleton eſcaped in an open boat by favour of a dark night. No further obſtacle now remained in the way of the Americans to the capital, except what aroſe from the nature of the country; and theſe indeed were very conſiderable. Nothing, however, could damp their ardour. Notwithſtanding it was now the middle of November, and the depth of winter was at hand, Colonel Arnold formed a deſign of penetrating through woods, moraſſes, and the moſt frightful ſolitudes from New-England to Canada by a nearer way than that which Montgomery had choſen; and this he accompliſhed in ſpite of every difficulty, to the aſtoniſhment of all who ſaw or heard of the attempt. The Canadians indeed were amazed at the exploit, and their inclination to revolt from Britain was ſomewhat augmented; but none of them as yet took up arms in behalf of America. The conſternation into which the town of Quebec was thrown proved detrimental rather than otherwiſe to the expedition; as it doubled the vigilance and activity of the inhabitants to prevent any ſurpriſe; and the appearance of common danger united all parties, who, before the arrival of Arnold, were contending moſt violently with one another. He was therefore obliged to content himſelf with blocking up the avenues to the town, in order to diſtreſs the garriſon for want of proviſions; and even this he was unable to do effectually, by reaſon of the ſmall number of his men. The matter was not much mended by the arrival of General Montgomery. The force he had with him, even when united to that of Arnold, was too inſignificant to attempt the reduction of a place ſo ſtrongly fortified, eſpecially with the aſſiſtance of only a few mortars and field-pieces. After the ſiege had continued through the month of December, General Montgomery, conſcious that he could accompliſh his end no other way than by ſurpriſe, reſolved to make an attempt on the laſt day of the year 1775. The method he took at this time was perhaps the beſt that human wiſdom could deviſe. He advanced by break of day, in the midſt of a heavy fall of ſnow, which covered his men from the ſight of the enemy Two real attacks were made by himſelf and Colonel Arnold, at the ſame time that two feigned attacks were made on two other places, thus to diſtract the garriſon, and make them divide their forces. One of the real attacks was made by the people of New-York, and the other by thoſe of New-England under Arnold. Their hopes of ſurpriſing the place, however, were defeated, by the ſignal for the attack being thro ſome miſtake given too ſoon. General Montgomery himſelf had the moſt dangerous place, being obliged to paſs between the river and ſome high rocks on which the Upper Town ſtands; ſo that he was forced to make what haſte he could to cloſe with the enemy. His fate, however, was now decided. Having forced the firſt barrier, a violent diſcharge of muſquetry and grape-ſhot from the ſecond killed him, his principal officers, and the moſt of the party he commanded; on which thoſe who remained immediately retreated. Colonel Arnold in the mean time made an attack on the Lower Town, and carried one of the barriers after an obſtinate reſiſtance of an hour; but in the action he himſelf received a wound, which obliged him to withdraw. The attack, however, was continued by the officers whom he had left, and another barrier forced: But the garriſon, now perceiving that nothing was to be feared except from that quarter, collected their whole force againſt it; and, after a deſperate engagement of three hours, overpowered the Americans, and obliged them to ſurrender. In this action, the valour of the American troops could not be exceeded. But now no hope remained, of the accompliſhment of their purpoſe, as General Arnold could ſcarce number 800 effective men under his command. He did not, however, abandon the province, or even remove to a greater diſtance than three miles from Quebec; and here he ſtill found means to annoy the garriſon very conſiderably, by intercepting their proviſions. The Canadians, notwithſtanding the bad ſucceſs of the American arms, ſtill continued friendly; and thus he was enabled to ſuſtain the hardſhips of a winter encampment in that ſevere climate, whilſt Congreſs, far from attributing his misfortunes to miſmanagement, was ſo pleaſed with his conduct as to create him a brigadier general. While hoſtilities were thus carried on with vigour in the N. the flame of contention was gradually extending itſelf in the S. Lord Dunmore, the governor of Virginia, was involved in diſputes ſimilar to thoſe which had taken place in the other colonies. Theſe had proceeded ſo far that the aſſembly was diſſolved; which in this province was attended with a conſequence unknown to the reſt. As Virginia contained a great number of ſlaves, it was neceſſary that a militia ſhould be kept conſtantly on foot to keep them in awe. During the diſſolution of the aſſembly, the militia laws expired; and the people, after complaining of the danger they were in from the negroes, formed a convention, which enacted that each county ſhould raiſe a quota for the defence of the province. Dunmore, on this, removed the powder from Williamſburgh, which created ſuch diſcontents, that an immediate quarrel would probably have enſued, had not the merchants of the town undertaken to obtain ſatisfaction for the injury ſuppoſed to be done to the community. This tranquillity, however, was ſoon interrupted; the people, alarmed by a report that an armed party were on their way from the man of war where the powder had been depoſited, aſſembled in arms, and determined to oppoſe by force any farther removals. In ſome of the conferences which paſſed at this time, the governor let fall ſome unguarded expreſſions, ſuch as threatening them with ſetting up the royal ſtandard, proclaiming liberty to the negroes, deſtroying the town of Williamſburgh, &c. which were afterwards made public, and very probably exaggerated in ſuch a manner as greatly to increaſe the public ferment. The people now held frequent aſſemblies. Some of them took up arms with a deſign to force the governor to reſtore the powder, and to take the public money into their own poſſeſſion: But on their way to Williamſburgh for this purpoſe, they were met by the receiver general, who became ſecurity for the payment of the gun-powder, and the inhabitants promiſed to take care of the magazine and public revenue. By this inſurrection, the governor was ſo much intimidated, that he ſent his family on board a man of war. He, himſelf, however, iſſued a proclamation, in which he declared the behavior of the perſons who promoted the tumult treaſonable, accuſed the people of diſaffection, &c. On their part, they were by no means deficient in recriminating; and ſome letters of his to Britain being about the ſame time diſcovered, conſequences enſued extremely ſimilar to thoſe which had been occaſioned by thoſe of Mr. Hutchinſon at Boſton. In this ſtate of confuſion, the governor thought it neceſſary to fortify his houſe with artillery, and procure a party of marines to guard it. Lord North's conciliatory propoſal arriving about this time, he uſed his utmoſt endeavours to cauſe the people to comply with it. But the clamour and diſſatisfaction were now ſo univerſal, that nothing elſe could be attended to. The governor had called an aſſembly, for the purpoſe of laying the conciliatory plan before them; but it had been little attended to. The aſſembly began their ſeſſion, by enquiring into the ſtate of the magazine. It had been broken into by ſome of the townſmen; for which reaſon ſpring guns had been placed there by the governor, which diſcharged themſelves upon the offenders at their entrance; theſe circumſtances, with others of a ſimilar kind, raiſed ſuch a violent uproar, that as ſoon as the preliminary buſineſs of the ſeſſion was over, the governor retired on board a man of war, informing the aſſembly that he durſt no longer truſt himſelf on ſhore. This produced a long courſe of diſputation, which ended in a poſitive refuſal of the governor to truſt himſelf again in Williamſburgh, even to give his aſſent to the bills, which could not be paſſed without it, although the aſſembly offered to bind themſelves for his perſonal ſafety. In his turn, he requeſted them to meet him on board a man of war, where he then was; but this propoſal was rejected, and all further correſpondence containing the leaſt appearance of friendſhip was diſcontinued. Lord Dunmore, thus deprived of his government, attempted to reduce by force thoſe whom he could no longer govern. Some of the moſt ſtrenuous adherents to the Britiſh cauſe, whom their zeal had rendered obnoxious at home, now repaired to him. He was alſo joined by numbers of ſlaves. With theſe and the aſſiſtance of the Britiſh ſhipping, he was for ſome time enabled to carry on a kind of predatory war, ſufficient to hurt and exaſperate, but not to ſubdue.—After ſome inconſiderable attempts on land, proclaiming liberty to the ſlaves, and ſetting up the royal ſtandard, he took up his reſidence at Norfolk, where the people were better affected to Britain than in moſt other places. A conſiderable force, however, was collected againſt him; and the natural impetuoſity of his temper prompting him to act againſt them with more courage than caution, he was entirely defeated, and obliged to retire to his ſhipping, which was now crowded by the number of thoſe who had incurred the reſentment of the Virginians. In the mean time, a ſcheme of the utmoſt magnitude was formed by one Mr. Conolly, a Pennſylvanian of an intrepid and aſpiring diſpoſition, and attached to the cauſe of Britain. The firſt ſtep of this plan was to enter into a league with the Ohio Indians. This he communicated to Lord Dunmore, and it received his approbation; upon which Connolly ſet out, and actually ſucceeded in his deſign. On his return, he was diſpatched to Gen. Gage, from whom he received a colonel's commiſſion, and ſet out for the Ohio, where, by the aſſiſtance of the Britiſh and Indians in thoſe parts, he was to penetrate through the back ſettlements into Virginia, and join Lord Dunmore at Alexandria. But, by accident, he was diſcovered, taken priſoner, and thrown into a dungeon. After the retreat of Lord Dunmore from Norfolk, that place was taken poſſeſſion of by the Americans, who at the ſame time greatly diſtreſſed thoſe on board Lord Dunmore's fleet, by refuſing to ſupply them with neceſſaries. Nor was this all; the vicinity of the ſhipping was ſo great as to afford the riflemen an opportunity of aiming at the people on board, and as they daily exerciſed themſelves in that manner a conſiderable number of the royaliſts were killed.—Theſe proceedings at laſt drew a remonſtrance from his Lordſhip; in which he inſiſted that the fleet ſhould be furniſhed with neceſſaries, and that the ſoldiers ſhould deſiſt from the cruel practice above mentioned; but both theſe requeſts being denied, a reſolution was taken to ſet fire to the town. A party accordingly landed under cover of a man of war, and ſet fire to that part which lay neareſt the ſhore; but the flames were obſerved at the ſame time to break forth in every other quarter, and the whole town was reduced to aſhes. This conflagration was ſuppoſed to have occaſioned a loſs of nearly one million and a half of dollars. In S. and N. Carolina, the governors were expelled and obliged to take refuge on board of men of war, as Lord Dunmore had been. Mr. Martin, governor of North Carolina was charged with attempting to raiſe the back ſettlers, conſiſting chiefly of Scots Highlanders againſt the colony. Having ſecured themſelves againſt any attempts from theſe enemies, they now proceeded to regulate their internal concerns in the ſame manner as the reſt of the colonies; and by the end of the year 1775, Britain beheld the whole of America united againſt her in the moſt determined oppoſition. Her vaſt poſſeſſions of that tract of land, ſince known by the name of the UNITED STATES, were now reduced to the town of Boſton; in which her forces were beſieged by an enemy with whom they were apparently not able to cope, and by whom they muſt, of courſe, expect in a very ſhort time to be expelled. The ſituation of the inhabitants of Boſton, indeed, was peculiarly unhappy. After having failed in their attempts to leave the town, Gen. Gage had conſented to allow them to retire with their effects; but he afterwards, treacherouſly refuſed to fulfil his promiſe. When he reſigned his place to General Howe in October, 1775, the latter, apprehenſive that they might give intelligence of the ſituation of the Britiſh troops, ſtrictly prohibited any perſon from leaving the place, under pain of military execution. Thus matters continued, till the ſecond of March, 1776, when General Waſhington opened a battery on the weſt ſide of the town, from whence it was bombarded with a heavy fire of cannon at the ſame time; and three days after, it was attacked by another battery from the eaſtern ſhore. This terrible attack continued for 14 days without intermiſſion; when Gen. Howe, finding the place no longer tenable, determined, if poſſible, to drive the enemy from their works. Preparations were therefore made for a moſt vigorous attack, on a hill called Dorcheſter Neck, which the Americans had fortified in ſuch a manner, as would, in all probability have rendered the enterprize next to deſperate. No difficulties, however, were ſufficient to daunt the ſpirit of the general; and every thing was in readineſs, when a ſudden ſtorm prevented this intended exertion of Britiſh valour. Next day, upon a more cloſe inſpection of the works they were to attack, it was thought adviſeable to deſiſt from the enterprize altogether. The fortifications were very ſtrong, and extremely well provided with artillery; and beſides other implements of deſtruction, upwards of 100 hogſheads of ſtones were provided to roll down upon the enemy, as they came up; which, as the aſcent was extremely ſteep, muſt have done prodigious execution. Nothing therefore now remained but to retreat; and even this was attended with the utmoſt difficulty and danger. The Americans, however, knowing that it was in the power of the Britiſh general to reduce the town to aſhes, which could not have been repaired in many years, did not give the leaſt moleſtation; and for the ſpace of a fortnight, the troops were employed in the evacuation of the place, from whence they carried along with them 2000 of the inhabitants, who durſt not ſtay, on account of their attachment to the Britiſh cauſe. From Boſton they ſailed to Halifax; but all their vigilance could not prevent a number of valuable ſhips from falling into the hands of the enemy. A conſiderable quantity of cannon and ammunition had alſo been left at Bunker's Hill and Boſton Neck; and in the town, an immenſe variety of goods, principally woollen and linen, of which the Americans ſtood very much in need.—The eſtates of thoſe who fled to Halifax were confiſcated; as well as of thoſe who were attached to government, and had remained in the town. As an attack was expected as ſoon as the Britiſh forces ſhould arrive, every method was employed to render the fortifications, already very ſtrong, impregnable. For this purpoſe, ſome foreign engineers were employed, who had before arrived at Boſton; and ſo eager were people of all ranks to accompliſh this buſineſs, that every able bodied man in the place, without diſtinction of rank, ſet apart two days in the week to complete it the ſooner. The Americans, exaſperated to the utmoſt by the proceedings of parliament, now formally renounced all connection with Britain, and declared themſelves INDEPENDENT. This celebrated declaration was publiſhed on the 4th of July, 1776. Previous to this, a circular letter had been ſent through each colony, ſtating the reaſons for it; and ſuch was the animoſity now every where prevailing againſt Great-Britain, that it met with univerſal approbation, except in the province of Maryland alone. It was not long, however, before the people of that colony, finding themſelves left in a very dangerous minority, thought proper to accede to the meaſures of the reſt.

AMERICA, THE UNITED STATES OF, HISTORY OF THE WAR WITH, IN 1776. After thus publicly throwing off all allegiance and hope of reconciliation, the Americans

cans ſoon found that an exertion of all their ſtrength was required, in order to ſupport their independence. Their arms, indeed, had not, during this ſeaſon, been attended with ſucceſs in Canada. Reinforcements had been promiſed to Col. Arnold, who ſtill continued the blockade of Quebec; but they did not arrive in time to ſecond his operations. Being ſenſible, however, that he muſt either deſiſt from the enterprize, or finiſh it ſucceſsfully, he recommenced in form; attempting to burn the ſhipping, and even to ſtorm the town itſelf. They were unſucceſsful, however, by reaſon of the ſmallneſs of their number, though they ſucceeded ſo far as to burn a number of houſes in the ſuburbs; and the garriſon were obliged to pull down the remainder, in order to prevent the fire from ſpreading. As the Americans, though unable to reduce the town, kept the garriſon in continual alarms, and in a very diſagreeable ſituation, ſome of the nobility collected themſelves into a body, under the command of Mr. Beaujeu, in order to relieve their capital; but they were met on their march by the Americans, and ſo completely defeated, that they were never afterwards able to attempt any thing. The Americans, however, had but little reaſon to plume themſelves on this ſucceſs. Their want of artillery at laſt convinced them, that it was impracticable in their ſituation, to reduce a place ſo ſtrongly fortified; the ſmall-pox at the ſame time made its appearance in their camp, and carried off great numbers; intimidating the reſt to ſuch a degree, that they deſerted in crowds. To add to their misfortunes, the Britiſh reinforcements unexpectedly appeared, and the ſhips made their way through the ice, with ſuch celerity, that the one part of their army was ſeparated from the other; and Gen. Carleton ſallying out as ſoon as the reignforcement was landed, obliged them to fly with the utmoſt precipitation, leaving behind them, all their cannon and military ſtores; at the ſame time that their ſhipping was entirely captured by veſſels ſent up the river for that purpoſe: But none of them fell into the hands of the Britiſh, excepting the ſick and wounded.—Gen. Carleton now gave a ſignal inſtance of his humanity: Being appriſed that many of the provincials had not been able to accompany the reſt in their retreat, and that they were concealed in woods, &c. in a very deplorable ſituation, he generouſly iſſued a proclamation, ordering proper perſons to ſeek them out, and give them relief, at the public expence; at the ſame time, leſt through fear of being made priſoners, they ſhould refuſe theſe offers of humanity, he promiſed, that as ſoon as their ſituation enabled them, they ſhould be at liberty to depart to their reſpective homes. The Britiſh general, now freed from any danger of an attack, was ſoon enabled to act offenſively againſt the Americans, by the arrival of the forces deſtined for that purpoſe from Britain. By theſe he was put at the head of 12,000 regular troops, among whom were thoſe of Brunſwick.—With this force he inſtantly ſet out for the Three Rivers, where he expected that Arnold would have made a ſtand; but he had fled to Sorel, a place 150 miles diſtant from Quebec, where he was at laſt met by the reignforcements ordered by Congreſs. Here though the preceding events were by no means calculated to inſpire much military ardour, a very daring enterpriſe was undertaken; and this was, to ſurpriſe the Britiſh troops poſted here, under generals Fraſer and Neſbit; of whom the former commanded thoſe on land, the latter ſuch as were on board of tranſports, and were but a little way diſtant. The enterpriſe was undoubtedly very hazardous, both on account of the ſtrength of the parties againſt whom they were to act, and as the main body of the Britiſh forces were advanced within 50 miles of the place: beſides that a number of armed veſſels and tranſports with troops, lay between them and the Three Rivers. Gen Thomſon, however, with 2000 choſen men, engaged in this enterpriſe. Their ſucceſs was by no means anſwerable to their ſpirit and valour. Though they paſſed the ſhipping without being obſerved, Gen. Fraſer had notice of their landing; and thus being prepared to receive them, they were ſoon thrown into diſorder, at the ſame time that Gen. Neſbit, having landed his forces, prepared to attack them in the rear. On this occaſion, ſome field pieces did prodigious execution, and a retreat was found to be unavoidable. Gen. Neſbit, however, had got between them and their boats; ſo that they were obliged to take a circuit through a deep ſwamp, while they were hotly purſued by both parties at the ſame time, who marched for ſome miles on each ſide of the ſwamp, till at laſt the miſerable Americans were ſheltered from further danger, by a wood, at the end of the ſwamp. Their general, however, was taken, with 200 of his men. By this diſaſter, the Americans loſt all hopes of accompliſhing any thing in Canada. They demoliſhed their works, and carried off their artillery with the utmoſt expedition. They were purſued, however, by Gen. Burgoyne; againſt whom it was expected that they would have collected all their force, and made a reſolute ſtand.—But they were now too much diſpirited by misfortune, to make any farther exertions of valour. On the 18th of June, the Britiſh general arrived at Fort St. John's which he found abandoned and burnt: Chamblee had ſhared the ſame fate, as well as all the veſſels that were not capable of being dragged up againſt the current of the river. Thus was the province of Canada entirely evacuated by the Americans, whoſe loſs in their retreat from Quebec, was not calculated at leſs than 1000 men, of whom 400 fell at once into the hands of the Britiſh, at a place called the Cedars, about 50 miles above Montreal. Gen. Sullivan, however, who conducted this retreat, after the affair of Gen. Thomſon, was acknowledged to have great merit in what he did, and received the thanks of Congreſs accordingly. This bad ſucceſs in the North, however, was ſomewhat compenſated, by what happened in the Southern colonies. We have formerly noticed, that Mr. Martin, governor of North Carolina, had been obliged to leave his province, and retire on board a man of war. Notwithſtanding this, he did not deſpair of reducing it again to obedience. For this purpoſe he applied to the Regulators, a daring ſet of Banditti, who lived in a kind of independent ſtate; and though conſidered by government as rebels, yet had never been moleſted, on account of their numbers, and known ſkill in the uſe of fire arms.—To the chiefs of theſe people commiſſions were ſent, in order to raiſe ſome regiments; and Col. Macdonald, a brave and enterpriſing officer, was appointed to command them. In February he raiſed the King's ſtandard, and collected ſome forces, expecting to be joined by a body of regulars, who were ſhipped from Britain to act againſt the S. colonies. The Americans, ſenſible of their danger, diſpatched what forces they had to act againſt the royaliſts; at the ſame time that they exerted themſelves to ſupport theſe with ſuitable re-inforcements. Their preſent force was commanded by gen. Moore, whoſe numbers were inferior to thoſe of Macdonald; for which reaſon the latter ſummoned him to join the king's ſtandard under pain of being treated as a rebel. But Moore, being well provided with cannon, and conſcious that nothing could be attempted againſt him, returned the compliment, by acquainting Col. Macdonald, that if he and his party would lay down their arms, and ſubſcribe an oath of fidelity to congreſs, they ſhould be treated as friends; but if they perſiſted in an undertaking for which it was evident they had no ſufficient ſtrength, they could not but expect the ſevereſt treatment. In a few days Gen. Moore found himſelf at the head of 8000 men, by the continual ſupplies which dailey arrived from all parts. The royal party amounted only to 2000, and they were deſtitute of artillery. They therefore had recourſe to a deſperate exertion of perſonal valour; by which they effected a retreat for 80 miles to Moore's Creek, within 16 miles of Wilmington. Could they have gained this place, they expected to have been joined by Gen. Martin, and Gen. Clinton, who had lately arrived with a conſiderable detachment. But Moore with his army purſued them ſo cloſe, that they were obliged to attempt the paſſage of the Creek itſelf, though a conſiderable body of the enemy, under the command of Col. Caſwell, with fortifications well planted with cannon, was poſted on the other ſide. The Creek, however, was found not to be fordable, and a wooden bridge, which the provincials had not time to deſtroy entirely, was, however, by pulling up part of the planks, and greaſing the remainder, rendered ſo ſlippery, that the royaliſts could not attempt it. In this ſituation they were, on the 27th of February, attacked by Moore with his ſuperior army, and totally defeated, with the loſs of their general and moſt of their leaders, as well as the braveſt of their men. Thus was the power of the republicans eſtabliſhed in North Carolina. Nor were they leſs ſucceſsful in Virginia; where Lord Dunmore, having long continued a uſeleſs predatory war, was at laſt driven from every Creek and road in the province. The people he had on board were diſtreſſed to the higheſt degree by confinement in ſmall veſſels. The heat of the ſeaſon, and the numbers crowded together, produced a peſtilential fever, which made great havock, eſpecially amoug the blacks. At laſt, however, finding themſelves in the greateſt hazard of periſhing, by famine as well as diſeaſe, they bade a final adieu to Virginia, ſome ſailing to Florida, ſome to Bermuda, and the reſt to the Weſt Indies. In S. Carolina the Americans had a more formidable enemy to deal with. A ſquadron, whoſe object was the reduction of Charleſton, had been fitted out in Dec. 1775; but by reaſon of unfavourable weather did not reach Cape Fear in N. Carolina, till the month of May, 1776: and here it met with further obſtacles till the end of the month. Thus the Americans, long noted for their alertneſs in raiſing fortifications, had time to ſtrengthen thoſe of Charleſton, in ſuch a manner as rendered it extremely difficult to be attacked. The Britiſh ſquadron conſiſted of two ſhips of 50 guns, 4 of 30, 2 of 20, an armed ſchooner and bomb-ketch, all under the command of Sir Peter Parker. The land forces were commanded by Lord Cornwallis, with Gen. Clinton and Vaughan. As they had yet no intelligence of the evacuation of Boſton, General Howe diſpatched a veſſel to Cape Fear with ſome inſtructions, but was too late; and in the beginning of June the ſquadron anchored off Charleſton bar. Here they were obliged to take out the guns from the two large ſhips, which were, notwithſtanding, ſeveral times in danger of ſticking faſt. The next obſtacle was a fort on Sullivan's iſland, 6 miles eaſt from Charleſton; which, though not completely finiſhed, was very ſtrong. However, the Britiſh generals reſolved to attack it; but though an attack was eaſy from the ſea, it was difficult to obtain a co-operation of the land forces. This was attempted by landing them on Long-Iſland, adjacent to Sullivan's iſland on the eaſt, from which it is ſeparated by a very narrow creek, ſaid not to be above two feet deep at low water. Oppoſite to this ford the republicans had poſted a ſtrong body of troops, with cannon and intrenchments; while Gen. Lee was poſted on the main land, with a bridge of boats betwixt that and Sullivan's iſland, ſo that he could at pleaſure ſend reinforcements to the troops in the fort on Sullivan's iſland. On the part of the Britiſh, ſo many delays occurred, that it was the 28th of June before matters were in readineſs for an attack; and by this time the republicans had abundantly provided for their reception. On the morning of that day the bomb-ketch began to throw ſhells into Fort Sullivan, and about mid-day the two 50 gun ſhips and 30 gun frigates were ordered to take their ſtation between Charleſton and the fort, to enfilade the batteries, and cut off the communication with the main land; but tho' two of them were diſentangled, they were found to be totally unfit for ſervice: the third was burnt, that ſhe might not fall into the hands of the enemy. The attack was thorefore confined to the five armed ſhips and bomb ketch, between whom and the fort a dreadful fire enſued. The Briſtol ſuffered exceſſively. The ſprings on her cable being ſhot away, ſhe was for ſome time expoſed to the enemy's fire. As the Americans poured in great quantities of red-hot balls, ſhe was twice in flames. The captain, (Morris) after receiving five wounds, was obliged to have his arm amputated. After this operation he returned to his place, where he received another wound, but ſtill refuſed to quit his ſtation; at laſt he received a red-hot ball in his belly, which inſtantly put an end to his life. Of all the officers and ſeamen who ſtood on the quarter-deck of this veſſel, not one eſcaped without a wound, excepting Sir Peter Parker; whoſe intrepidity and preſence of mind on this occaſion were very remarkable. The engagement laſted till darkneſs put an end to it. Little damage was done by the Britiſh, as the works of the republicans lay ſo low that many of the ſhot flew over; and the fortifications, being compoſed of Palm-trees mixed with earth, were extremely well calculated to reſiſt the impreſſion of cannon. During the height of the attack, the American batteries remained for ſome time ſilent, ſo that it was concluded that they had been abandoned; but this was found to proceed only from want of powder; for as ſoon as a ſupply of this neceſſary article was obtained, the firing was reſumed as briſkly as before. During the whole of this deſperate engagement, the land forces could give no aſſiſtance to the fleet. The American works were found to be much ſtronger than they had imagined, and the depth of water effectually prevented them from making any attempt. The killed and wounded on the part of the Britiſh amounted to about 200.

The Briſtol and Experiment were ſo much damaged, that it was thought they could not have been got over the bar; however, this was at laſt accompliſhed by a very great exertion of naval ſkill, to the ſurpriſe of the Americans, who had expected to make them both prizes. On the American ſide, the loſs was judged to have been very conſiderable, as moſt of their guns were diſmounted, and reinforcements had poured into the fort during the whole time of the action. They now began to think of trying their valour by ſea, and of forming a navy that might be able to protect their trade, and do eſſential hurt to the enemy. In the beginning of March, Commodore Hopkins was diſpatched with 5 frigates to the Bahama iſlands, where he made himſelf maſter of the ordnance and military ſtores; but the gun-powder, which had been the principal object was removed. On his return he captured ſeveral veſſels; but was foiled in his attempt on the Glaſgow frigate, which found means to eſcape, notwithſtanding the efforts of his whole ſquadron. The Americans, hitherto, had been, on the whole, ſucceſsful in their operations; but now they were doomed, for a time, to experience misfortune, miſery and diſgrace; the enemy overrunning their country, and their own armies not being able to face them in the field. The province of New-York, as being the moſt central colony, and moſt acceſſibly by ſea, was pitched upon for the object of the main attack. The force ſent againſt it conſiſted of ſix ſhips of the line, and 30 frigates, beſides other armed veſſels and a number of tranſports. The fleet was commanded by Lord Howe, and the land forces by his brother gen. Howe, who was now at Halifax. The latter, however, a conſiderable time before his brother arrived, had ſet ſail from Halifax, and lay before New-York, but without attempting to commence hoſtilities until he ſhould be joined by his brother. The Americans had, according to cuſtom, fortified New-York and the adjacent iſlands in an extraordinary manner. However, Gen. Howe was ſuffered to land his troops on Staten-Iſland, where he was ſoon joined by a number of the inhabitants. About the middle of July, Lord Howe arrived with the grand armament; and being one of the commiſſioners appointed to receive the ſubmiſſions of the coloniſts, but publiſhed a circular letter to this purpoſe to the ſeveral governors, who had lately been expelled from their provinces, deſiring to make the extent of his commiſſion, and the powers he was inveſted with by parliament, as public as poſſible. Here, however, Congreſs ſaved him trouble, by ordering this letter and declaration to be publiſhed in all the newſpapers, that every one might ſee the inſidiouſneſs of the Britiſh miniſtry, and that they had nothing to truſt to beſides the exertion of their own valour. Lord Howe next ſent a letter to Gen. Waſhington; but it was directed to "George Waſhington, Eſq." the General refuſed to accept it, as not being directed in the ſtyle ſuitable to his ſtation. To obviate this objection, Adjutant-general Patterſon was ſent with another letter, directed, "To George Waſhington, &c. &c. &c." But though a very polite reception was given to the bearer, Gen. Waſhington utterly refuſed the letter: nor could any explanation of the adjutant induce him to accept it. The only intereſting part of the converſation was that relating to the powers of the commiſſioners, of which Lord Howe was one. The adjutant told him, that theſe powers were extenſive; that the commiſſioners were determined to exert themſelves to the utmoſt to bring about a reconciliation; and that he hoped the general would conſider this viſit as a ſtep towards it. Gen. Waſhington replied, that it did not appear that theſe powers conſiſted in any thing elſe than granting *pardons;* and as America had committed *no offence*, ſhe aſked *no forgiveneſs*, and was only defending her unqueſtionable rights. The deciſion of every thing being now by the conſent of both parties left to the ſword, hoſtilities commenced as ſoon as the Britiſh troops could be collected. This, however, was not done before the month of Auguſt; when they landed without oppoſition, on Long-Iſland, oppoſite to the ſhore of Staten-Iſland. Gen. Putnam with a large body of troops, lay encamped and ſtrongly fortified on a peninſula on the oppoſite ſhore, with a range of hills between the armies, the principal paſs of which was near *Flat-buſh*. Here the centre of the Britiſh army, conſiſting of Heſſians, took poſt; the left wing, under General Grant, lying near the ſhore; and the right, conſiſting of the Britiſh forces, lay under Lord Percy, Cornwallis, and Gen. Clinton. Putnam had ordered the paſſes to be ſecured by large detachments, which was executed as to thoſe at hand; but one of the utmoſt importance, that lay at a diſtance, was entirely neglected. This gave an opportunity to a large body of troops under Lord Percy and Clinton to paſs the mountains and attack the Americans in the rear, while they were engaged with the Heſſians in front. Through this piece of negligence, their defeat became inevitable. Thoſe who were engaged with the Heſſians firſt perceived their miſtake, and began a retreat towards their camp; but the paſſage was intercepted by the Britiſh troops, who drove them back into the woods. Here they were met by the Heſſians; and thus they were for many hours ſlaughtered between the two parties, no way of eſcape remaining but by breaking through the Britiſh troops, and thus regaining their camp. In this attempt many periſhed; and the right wing, engaged with Gen. Grant, ſhared the ſame fate. The victory was complete; and the Americans loſt on this fatal day (Aug. 27th) upwards of 1000 men; indeed the Britiſh accounts ſtate the loſs at between 3000 and 4000 men; 2000 of whom, they ſay, were killed in the battle or purſuit. The ardor of the Britiſh troops was now ſo great that they could ſcarce be reſtrained from attacking the lines of the Americans, but for this there was no occaſion, as it was certain they could not be defended. The Americans therefore reſolved to abandon their camp. Accordingly, on the night of the 29th of Aug. the whole of the continental troops were ferried over with the utmoſt ſecrecy and ſilence; ſo that in the morning the Britiſh had nothing to do but take poſſeſſion of the camp and artillery which they had abandoned. This victory, though complete, was very far from being ſo deciſive as the conquerers imagined. Lord Howe, ſuppoſing that it would intimidate the Congreſs into terms, ſent Gen. Sullivan, who had been taken priſoner in the late action, to Congreſs, with a meſſage, importing, that though he could not conſiſtently treat with them as a legal aſſembly, yet he would be very glad to confer with any of the members in their private capacity; ſetting forth at the ſame time the nature and extent of his powers as commiſſioner. But the Congreſs were not as yet ſufficiently humbled, to derogate in the leaſt from the dignity of character they had aſſumed.—

They replied, that the Congreſs of the Free and Independent States of America could not conſiſtently ſend any of its members in another capacity than that which they had publicly aſſumed; but as they were extremely deſirous of reſtoring peace to their country upon equitable conditions, they would appoint a committee of their body to wait upon him, and learn what propoſals he had to make. This produced a conference. The committee appointed by Congreſs, was compoſed of Dr. Franklin, Mr. Adams, and Mr. Rutledge. They were politely received by Lord Howe, but the conference proved as fruitleſs as before independence had been declared; and the final anſwer of the deputies was, that they were extremely willing to enter into any treaty with Great-Britain that might conduce to the good of both nations, but that they would not treat in any other character than that of INDEPENDENT STATES. This poſitive declaration inſtantly put an end to all hopes of reconciliation; and it was reſolved to proſecute the war with the utmoſt vigor. Lord Howe, after publiſhing a manifeſto, in which he declared the refuſal of Congreſs, and that he himſelf was willing to confer with all well diſpoſed perſons about the means of reſtoring public tranquility, prepared for reducing the city of New-York. Here the American troops were poſted, and from a great number of batteries, continually annoyed the Britiſh ſhipping. The Eaſt River lay between them, about 1,200 yards in breadth, which the Britiſh troops were extremely deſirous of paſſing. At laſt the ſhips having, by an inceſſant cannonade of ſeveral days, ſilenced the moſt troubleſome batteries, a body of troops was ſent up the river to a bay, about three miles diſtant, where the fortifications were leſs ſtrong than in other places. Here, having driven off the Americans by the cannon of the fleet, they marched directly towards the city; but the republicans, finding that they ſhould now be attacked on all ſides, abandoned the city, and retired to the north of the iſland, where their principal force was collected. In their paſſage, they ſkirmiſhed with the Britiſh, but carefully avoided a general engagement; and it was obſerved that they did not behave with that impetuous valour which had hitherto marked their character. The Britiſh and American armies were not now above two miles diſtant from each other. The former lay encamped from ſhore to ſhore for an extent of two miles, being the breadth of the iſland, which though 15 miles long, exceeds not two in any part in breadth. The Americans, who lay directly oppoſite, had ſtrengthened their camp with many fortifications; at the ſame time, being maſters of all the paſſes betwixt the two camps, they were the better enabled to defend themſelves againſt any army much more numerous than their own: and they had alſo ſtrongly fortified a paſs called *King's Bridge*, whence they could ſecure a paſſage to the continent in caſe of any misfortune. Here General Waſhington, to inure the provincials to actual ſervice, and at the ſame time to annoy the enemy as much as poſſible, employed his troops in continual ſkirmiſhes; by which it was obſerved that they ſoon recovered their ſpirits, and behaved with ther uſual boldneſs. As the ſituation of the two armies was inconvenient for the Britiſh generals, it was reſolved to make ſuch movements as might oblige General Waſhington to relinquiſh his ſtrong ſituation. Within a few days after the evacuation of New-York by the Americans, about a fourth part of that city was reduced to aſhes. The Britiſh attributed this fatal event to ſome perſons who had been left behind by the provincials for that very purpoſe, and many perſons, ſaid to be incendiaries, were without mercy thrown into the flames. It was now determined to force the American army to a greater diſtance. For this purpoſe, Gen. Howe having left Lord Percy with ſufficient force to garriſon New-York, he embarked his army in flat-bottomed boats, by which they were conveyed through that dangerous paſſage called *Hell-Gate*, and landed near the town of Weſt-Cheſter, lying on the continent towards Connecticut. Here having received a ſupply of men and proviſions, they moved to New-Rochelle, ſituated on the ſound which ſeparates Long-Iſland from the continent. After this, receiving freſh reinforcements, they made ſuch movements as threatened to diſtreſs the Americans very much, by cutting off their convoys of proviſions from Connecticut, and thus force them to an engagement. This, however, Gen. Waſhington determined at all events to avoid. He therefore extended his forces into a long line oppoſite to the way in which the enemy marched, keeping the Brunx, a river of conſiderable magnitude, between the two armies, with the North-River on his rear. Here again the Americans continued for ſome time to ſkirmiſh with the royal army, until at laſt the Britiſh general found means to attack them advantageouſly at a place called the *White-Plains*, and drove them from ſome of their poſts. The victory on this occaſion was much leſs complete than the former; however, it obliged the republicans once more to ſhift their ground, and to retreat farther up the country. Gen. Howe purſued them for ſome time; but at laſt finding his endeavors vain to bring the Americans to a pitched battle, he determined to give over ſuch an uſeleſs chace, and reduce the forts which the Americans ſtill retained in the neighbourhood of New-York. In this he met with the moſt complete ſucceſs. The Americans, on the approach of the king's forces, retreated from King's Bridge into Fort-Waſhington; and this, as well as Fort-Lee, which lay in the neighborhood, was quickly reduced, though the garriſon made their eſcape. Thus the Jerſeys were laid open to the incurſions of the Britiſh troops; and ſo fully were theſe provinces taken poſſeſſion of by the royal army, that its winter quarters extended from N. Brunſwick to the river Delaware. Sir Henry Clinton undertook an expedition to Rhode-Iſland, and became maſter of it without loſing a man. His expedition was alſo attended with this further advantage, that the American fleet under commodore Hopkins, was obliged to ſail as far as poſſible up the Providence, and thus remained entirely uſeleſs. The ſame ill ſucceſs continued to attend the Americans in other parts. After their expulſion from Canada, they had croſſed the lake Champlain, and taken up their quarters at Crown-Point, as we have already mentioned. Here they remained for ſome time in ſafety, as the Britiſh had no veſſels on the lake, and conſequently Gen. Burgoyne could not purſue them. To remedy this deficiency, there was no poſſible method, but either to conſtruct veſſels on the ſpot, or take to pieces ſome veſſels already conſtructed, and drag them up the river into the lake. This, however, was effected in no longer a ſpace than three months; and the Britiſh general, after incredible toil and difficulty, ſaw himſelf in poſſeſſion of a great number of veſſels, by which he was enabled to purſue his enemies, and invade them in his turn. The labor undergone at this time by the ſea and land forces muſt indeed have been prodigious; ſince there were conveyed over land, and dragged up the rapids of St. Lawrence, no fewer than 30 large long-boats, 400 batteaux, beſides a vaſt number of flat bottomed boats, and a gondola of 30 tons. The intent of the expedition was to puſh forward to Albany, for winter quarters, and next ſpring effect a junction with Gen. Howe, when it was not doubted that the united force and ſkill of theſe two commanders would ſpeedily put a termination to the war. By the difficulties with which the equipment of this fleet had been attended, it was the beginning of October before the expedition could be undertaken. It conſiſted of one large veſſel with three maſts, carrying 18 twelve pounders; two ſchooners, the one carrying 14, the other 12 ſix pounders; a large flat-bottomed radeau with 6 twenty-four and 6 twelve pounders; and a gondola with 8 nine pounders. Beſides theſe were 20 veſſels of a ſmaller ſize, called *gun-boats*, carrying each a piece of braſs ordnance from 9 to 24 pounders. Several long-boats were fitted out in the ſame manner; and beſides theſe, there was a vaſt number of boats and tenders of various ſizes, to be uſed as tranſports for the troops and baggage. Theſe were manned by a number of ſelect ſeamen, and the guns were to be ſerved by a detachment from the corps of artillery; the officers and ſoldiers appointed for this expedition were alſo choſen out of the whole army. To oppoſe this formidable armament the Americans had only a very inconſiderable force, commanded by Gen. Arnold; who, after engaging part of the Britiſh fleet for a whole day, took advantage of the darkneſs of the night to ſet ſail without being perceived, and next morning was out of ſight; but he was ſo hotly purſued by the Britiſh, that on the ſecond day after, he was overtaken, and forced to a ſecond engagement. In this he behaved with great gallantry; but his force being very inferior to that of the enemy, he was obliged to run his ſhips aſhore and ſet them on fire. A few only eſcaped to Lake George; and the garriſon of Crown-Point, having deſtroyed or carried off every thing of value, retired to Ticonderoga. Thus the affairs of the Americans ſeemed every where going to wreck: even thoſe who had been moſt ſanguine in their cauſe began to waver. The time, alſo, for which the ſoldiers had enliſted themſelves was now expired; and the bad ſucceſs of the preceding campaign had been ſo very diſcouraging, that no perſon was willing to engage during the continuance of a war, of which the event ſeemed to be ſo doubtful. In conſequence of this, therefore, Gen. Waſhington found his army daily decreaſing in ſtrength; ſo that from 30,000, of whom it conſiſted when Gen. Howe landed on Staten-Iſland, ſcarce a tenth part could now be muſtered. To aſſiſt the chief commander as much as poſſible, Gen. Lee had collected a body of forces in the north; but on his way ſouthward, having imprudently taken up his lodging at ſome diſtance from his troops, he was made priſoner. The loſs of this general was much regretted, more eſpecially as he was of ſuperior quality to any priſoner in the poſſeſſion of the coloniſts, and could not therefore be exchanged. Six field officers were offered in exchange for him, and refuſed; and the Congreſs were highly irritated at its being reported, that he was to be treated as a deſerter, having been a half-pay officer in the Britiſh ſervice at the commencement of the war. They therefore threatened to retaliate on the priſoners in their poſſeſſion, whatever puniſhment ſhould be inflicted on any of thoſe taken by the Britiſh, and eſpecially that their conduct ſhould be regulated by the treatment of Gen. Lee. Mean time they proceeded with the moſt indefatigable diligence to recruit their army, and bound their ſoldiers to ſerve for a term of three years, or during the continuance of the war. The army deſigned for the enſuing campaign, was to conſiſt of 88 battalions; of which each ſtate was to contribute its quota; and 20 dollars were offered as a bounty to each ſoldier, beſides an allotment of lands at the end of the war. To defray the expence, Congreſs borrowed five millions of dollars at five per cent; for payment of which the United States became ſurety. At the ſame time, to animate the people to vigorous exertions, a declaration was publiſhed, in which they ſet forth the neceſſity there was for taking proper methods to inſure ſucceſs in their cauſe; they endeavored to palliate as much as poſſible the misfortunes which had already happened; and repreſented the true cauſe of the preſent diſtreſs to be the ſhort term of enliſtment. This declaration, together with the imminent danger of Philadelphia, determined the Americans to exert themſelves to the utmoſt, to reinforce Gen. Waſhington's army. They ſoon received farther encouragement, however, by an exploit of that Gen. againſt the Heſſians. As the Royal army extended in different cantonments for a great way, Gen. Waſhington, perceiving the immediate danger to which Philadelphia was expoſed, reſolved to make ſome attempt on thoſe diviſions of the enemy which lay neareſt that city. A body of Heſſians, were, at that time, quartered at Trenton, and theſe he ſurpriſed early on the morning of the 26th of Dec. and totally defeated, with the loſs of their arms, ammunition, and artillery, and nearly 1000 priſoners. Their commander, Col. Ralle, was likewiſe mortally wounded. This action, though ſeemingly of no deciſive nature, was ſufficient to turn the fortune of war in favor of America. It tended greatly to leſſon the fear which the Americans had of the Heſſians, at the ſame time that it abated the confidence which the Britiſh had till now put in them. Reinforcements came in to Gen. Waſhington's army from all quarters; ſo that he was ſoon in a condition to leave Philadelphia, and take up his quarters at Trenton. Emboldened by his ſucceſs, he determined to make an attempt on a diviſion of the Britiſh forces ſtationed at Maidenhead, half way between Trenton and Princetown. This conſiſted of 3 regiments under the command of Col. Mawhood, an officer of great merit. The troops were ſurpriſed on their march; but though they were ſeparately ſurrounded by a force ſo vaſtly ſuperior, they charged ſo reſolutely with their bayonets, that they effected a retreat. Theſe attempts of the Americans, however, with the hoſtile diſpoſition of the people, ſhowed the impoſſibility of maintaining poſts ſo far advanced in an enemy's country; ſo that it was reſolved to retreat towards Brunſwick, in order to prevent it, with the troops and magazines it contained, from falling into the hands of the republicans. Gen. Waſhington loſt no opportunity of recovering what had been loſt; and by dividing the army into ſmall parties, which could be re-united on a few hours warning, he in a manner entirely covered the country with it, and re-poſſeſſed himſelf of all the important places. Thus ended the campaign of 1776, with ſcarce any real advantage, except the acquiſition of the city of New-York, and a few fortreſſes in its neighborhood; where the troops were conſtrained to act with as much circumſpection, as if they had been beſieged by a victorious army, inſtead of being themſelves the conquerors.

AMERICA, UNITED STATES OF, HISTORY OF THE WAR WITH, IN 1777. The army at New-York began, in 1777, to exerciſe a kind of predatory war, by ſending out parties to make incurſions, and take or deſtroy ſuch forts as lay on the banks of rivers, to which their great command of ſhipping gave them acceſs. In this they were generally ſucceſsful; the magazines at Peekſkill being deſtroyed, the town of Danbury in Connecticut burnt, and that of Ridgefield taken poſſeſſion of. In returning from the laſt expedition, the Britiſh were haraſſed by the American troops under Arnold, Wooſter and Sullivan; but they made good their retreat, with the loſs of only 170 killed and wounded. On the American ſide the loſs was much greater; Gen. Wooſter was killed, and Arnold in imminent danger. On the other hand, the Americans deſtroyed the ſtores at Sagg-harbour, on Long-Iſland, and made priſoners of all who defended the place. But as this method of making war ſerved little purpoſe, it was reſolved to make an attempt on Philadelphia. It was thought that this could be done through the Jerſies; but Gen. Waſhington had received ſuch large reinforcements, and poſted himſelf ſo ſtrongly, that it was found to be impracticable. Many ſtratagems were uſed to draw him from this ſtrong ſituation, but without ſucceſs; ſo that it was found neceſſary to make the attempt on Philadelphia by ſea. While the preparations for this were going forward, the Americans made amends for the capture of Gen. Lee by that of Gen. Preſcott, who was ſeized in his quarters with his aid-de-camp, in much the ſame manner as Lee had been. This was exceedingly mortifying to the General himſelf, as he had not long before ſet a price upon Gen. Arnold, by offering a ſum of money to apprehend him; which the latter anſwered by ſetting a *lower* price upon Gen. Preſcott. It was the 23d of July before the Britiſh fleet was able to ſail from Sandy-Hook. The force employed conſiſted of 36 battalions of Britiſh and Heſſians, a regiment of light-horſe, and a body of royaliſts raiſed at New-York. After a week's ſailing they arrived at the mouth of the Delaware; but they learned there, that the navigation of the river was ſo effectually obſtructed, that no poſſibility of forcing a paſſage remained. Upon this it was reſolved to proceed farther Southward to Cheſapeak Bay, from whence the diſtance to Philadelphia was not great, and where the American army would find leſs advantage from the nature of the country, than in the Jerſies. The navigation from Delaware to Cheſapeak took up the beſt part of Auguſt, and that up the Bay itſelf was extremely difficult and tedious. At laſt, having ſailed up the Elk as far as was practicable, the troops were landed without oppoſition, and ſet forward on their intended expedition. On this Gen. Waſhington left the Jerſies, and haſtened to the relief of Philadelphia; and in the beginning of September met the Royal army at Brandy-wine Creek about mid-day, between the head of the Elk and Philadelphia. Here a general engagement enſued on the 11th of September, in which the Americans were worſted through the ſuperior diſcipline of the Britiſh troops; and it was only through the approach of night, that they were ſaved from being entirely deſtroyed. On this occaſion the republicans loſt about one thouſand killed and wounded, beſides four hundred taken priſoners. The loſs of this battle proved alſo the loſs of Philadelphia. Gen. Waſhington retired towards Lancaſter, an inland town, at ſome conſiderable diſtance from Philadelphia. Here the Britiſh General took ſuch meaſures as muſt have forced the Americans to a ſecond engagement; but a violent rain, which laſted a day and a night, prevented his deſign. Gen. Howe having now perceived that the Americans would not venture a battle even to preſerve their capital, took peaceable poſſeſſion of it on the 26th of Sept. His firſt care was to cut off, by ſtrong batteries, the communication between the upper and lower parts of the river; which was executed notwithſtanding the oppoſition of ſome American armed veſſels; one of which was taken. His next taſk was to open a communication with it by ſea; and this was a work of no ſmall difficulty. A vaſt number of batteries and forts had been erected, and immenſe machines, formed like *chevaux de friſe*, ſunk in the river to prevent its navigation. As the fleet was ſent to the mouth of the river to co-operate with the army, this work, however difficult, was accompliſhed; nor did the provincials give much oppoſition, knowing that all places of this kind were not untenable. Gen. Waſhington, however, took the advantage of the royal army being divided, to attack the camp of the principal diviſion, at German-town. Though he reached the place of deſtination by three in the morning, the patroles had time to call the troops to arms. The Americans made a very reſolute attack: but they were received with ſuch bravery, that they were compelled to retreat in great diſorder; yet they carried off their cannon, though purſued for a conſiderable way, after having 300 killed, 600 wounded, and upwards of 400 taken priſoners, among whom were 54 officers. On the Britiſh ſide, the loſs amounted to 430 wounded and priſoners, and 70 killed; but among the laſt were Gen. Agnew and Col. Bird, with ſome other excellent officers. Thus the campaign of 1777 concluded ſucceſsfully on the part of the Britiſh in Pennſylvania. In the North, however, matters wore a different aſpect. The expedition in that quarter had been projected by the Britiſh miniſtry as the moſt effectual method that could be taken to cruſh the colonies at once. The four provinces of New-England had originally begun the confederacy againſt Britain, and were ſtill conſidered as the moſt active in the continuation of it; and it was thought, that any impreſſion made upon them would contribute in an effectual manner, to the reduction of all the reſt. For this purpoſe, an army of 4000 choſen Britiſh troops, and 3000 Germans, was put under the command of General Burgoyne. Gen. Carleton was directed to uſe his influence with the Indians, to perſuade them to join in this expedition; and the province of Quebec was to furniſh large parties to join in it. The officers who commanded under General Burgoyne were General Philips of the artillery, Generals Fraſer, Powell and Hamilton, with the German officers, Generals Reideſel and Speecht. The ſoldiers were all excellently diſciplined, and had been kept in their winter quarters with all imaginable care, in order to prepare them for the expedition on which they were going. To aid the principal expedition, another was projected on the Mohawk river, under Colonel St. Leger, who was to be aſſiſted by Sir John Johnſon, ſon of the famous Sir William Johnſon, who had ſo greatly diſtinguiſhed himſelf in the war of 1755. On the 21ſt of June, 1777, the army encamped on the weſtern ſide of the Lake Champlain; where being joined by a conſiderable body of Indians, Gen. Burgoyne iſſued a moſt pompous proclamation, in which the force of Britain, and that which he commanded, was ſet forth in very oſtentatious terms, and the campaign opened with the ſiege of Ticonderoga. The place was ſtrong, and garriſoned by 6000 men under Gen. Sinclair; nevertheleſs, the works were ſo extenſive, that even this number was ſcarce ſufficient to defend them properly. The Americans, therefore, after ſome ineffectual attempts to defend it, abandoned the fort entirely, taking the road to Skeneſborough, to the S. of Lake George; while their baggage, artillery, and military ſtores, were ſent to it by water. But the Britiſh generals were determined not to let them paſs ſo eaſily. Both were purſued and both overtaken. Their armed veſſels conſiſted only of 5 gallies, 2 of which were taken, and three blown up; on which they ſet fire to their boats and fortifications at Skeneſborough. On this occaſion the Americans loſt 200 boats, 130 pieces of cannon, with all their proviſions and baggage. Their land forces under Colonel Francis made a brave defence againſt General Fraſer; and being greatly ſuperior in number, had almoſt overpowered him, when Gen. Reideſel, with a large body of Germans, came to his aſſiſtance. The Americans were now overpowered in their turn, and their commander being killed, they fled on all ſides with great precipitation. In this ſituation, they firſt thought of making a ſtand at Fort-Anne; but as they deſpaired of ſucceſs after ſo many diſaſters, they ſet fire to it and retired to Fort-Edward. Gen. Burgoyne, however, was obliged to ſuſpend his operations, and wait at Skeneſborough for the arrival of his tents, proviſions, &c. but at laſt, after undergoing the utmoſt difficulty, he arrived with his army before Fort-Edward, about the end of July. Here Gen. Schuyler had been for ſome time endeavoring to recruit the ſhattered American forces, and had been joined by Gen. Sinclair with the remains of his army; the garriſon of Fort-George alſo, ſituated on the lake of that name, had evacuated it, and retired to Fort-Edward. But on the approach of the royal army, they retired from it alſo, and formed their head-quarters at Saratoga. Notwithſtanding the great ſucceſſes of the Britiſh general, they ſhewed not the leaſt diſpoſition to ſubmit, but ſeemed only to conſider how they might make the moſt effectual reſiſtance. For this purpoſe, the militia was every where draughted to join the army at Saratoga; and ſuch numbers of voluntees were daily added, that they ſoon began to recover from the terror into which they had been thrown. That they might have a commander whoſe abilities could be relied on, Gen. Arnold was appointed, who repaired to Saratoga with a conſiderable train of artillery; but receiving intelligence that Col. St. Leger was proceeding with great rapidity in his expedition on the Mohawk, he removed to Stil-water, about half way between Saratoga, and the junction of the Mohawk and Hudſon's river. The Colonel, in the mean time had advanced as far as Fort-Stanwix; the ſiege of which he preſſed with great vigor. On the 6th Auguſt, underſtanding that a ſupply of proviſions, eſcorted by 8 or 900 men, was on the way to the fort, he diſpatched Sir John Johnſon with a ſtrong detachment to intercept it. This he did ſo effectually, that, beſides intercepting the proviſions, 400 of its guard were ſlain, 200 taken, and the reſt eſcaped with great difficulty. The garriſon, however, were not to be intimidated by this diſaſter, nor by the threats of the Col. On the contrary, they made ſeveral ſucceſsful ſallies under Col. Willet, who in company with another, ventured out of the fort, and, eluding the vigilance of the enemy, paſſed through them, in order to haſten the march of Gen. Arnold to their aſſiſtance. Thus the affairs of Col. St. Leger were in no very favorable ſituation, notwithſtanding his late ſucceſs, and they were ſoon totally ruined by the deſertion of the Indians. They had been alarmed by the report of Gen. Arnold's advancing with 2000 men to the relief of the fort; and another report being ſpread, that Gen. Burgoyne had been defeated, and was flying before the provincials, he was obliged to retreat, which could not be effected without the loſs of the tents and ſome of the artillery and military ſtores. Gen. Burgoyne, in the mean time, notwithſtanding all the difficulties he had already ſuſtained, found that he muſt ſtill encounter more. The roads he had made with much labor, were deſtroyed, either by the wetneſs of the ſeaſon, or by the enemy: ſo that the proviſions he brought from Fort-George, could not arrive at his camp, without the moſt prodigious toil. On hearing of the ſiege of Fort-Stanwix, by Col. St. Leger, he determined to move forward, in hopes of incloſing the enemy betwixt his own army and that of St. Leger, or of obtaining the command of all the country between Fort-Stanwix and Albany; or a junction with Col. St. Leger, which could not but be attended with the moſt happy conſequences. The only difficulty was the want of proviſions; and this it was propoſed to remedy, by reducing the provincial magazines at Bennington. For this purpoſe, Col. Baum, a German officer of great bravery, was choſen with a body of 500 men, and the whole army marched up the river's bank, and encamped almoſt oppoſite to Saratoga, with the river betwixt it and that place. An advanced party was poſted at Battan-Kill, between the camp and Bennington, in order to ſupport him. In their way, the Britiſh ſeized a large ſupply of cattle and proviſions, which were immediately ſent to the camp; but the badneſs of the roads retarded their march ſo much, that intelligence of their deſign was ſent to Bennington. Underſtanding now, that the American force was greatly ſuperior to his own, the Colonel acquainted the General, who immediately diſpatched Colonel Breyman, with a party to his aſſiſtance; but though the ſame cauſes that had retarded the march of Colonel Baum, this aſſiſtance could not arrive in time. Gen. Starke, in the mean time, who commanded at Bennington, determined to attack the two parties ſeparately; and advanced againſt Colonel Baum, whom he ſurrounded on all ſides. The troops defended themſelves with great valour, but were, to a man, either killed or taken. Colonel Breyman, after a deſperate engagement, effected a retreat, by the darkneſs of the night. Gen. Burgoyne, thus diſappointed, applied himſelf to procure proviſions from Fort-George; and having at length amaſſed a ſufficient quantity to laſt for a month, he threw a bridge of boats over the river Hudſon, which he croſſed about the middle of September, encamping on the hills and plains near Saratoga. As ſoon as he approached the provincial army, at this time encamped at Stillwater, under Gen. Gates, he put himſelf at the head of the central diviſion of his army, having Gen. Fraſer and Col. Breyman on the right, with Gen. Reideſel and Philips on the left; and advanced towards the enemy on the 19th September.—But the Americans did not now wait to be attacked: on the contrary, they attacked the central diviſion with the utmoſt violence; and it was not until General Philips with the artillery came up, that they could be repulſed. On this occaſion, the Britiſh loſt rather more than 500 in killed, wounded and priſoners, whilſt the loſs of the Americans was only 319. It is, therefore, by no means ſurpriſing that the former were very much alarmed at the obſtinate reſolution ſhown by the Americans. Their allies, the Indians, began to deſert in great numbers; and the general was in the higheſt degree mortified, by having no intelligence of any aſſiſtance from Sir Henry Clinton. He was at laſt informed, that Sir Henry intended to make a diverſion on the North-River, in his favor. This afforded but little comfort: however, he returned an anſwer by ſeveral truſty perſons, whom he diſpatched different ways, ſtating his preſent diſtreſſed ſituation, and mentioning that the proviſions and other neceſſaries he had, would only enable him to hold out, till the 12th October. In the beginning of October, he had begun to diminiſh the ſoldiers allowance. On the 7th, he determined to move towards the enemy; and ſent a body of 1,500 men to reconnoitre their left wing; intending, if poſſible, to break through it in order to effect a retreat. The detachment, however, had not proceeded far, when a dreadful attack was made upon the left wing of the Britiſh army, which was with difficulty preſerved from being entirely broken, by a reinforcement brought up by General Fraſer, who was killed in the attack. After the troops had, with the moſt deſperate efforts, regained their camp, it was furiouſly aſſaulted by Gen. Arnold, who would have forced the entrenchments, had he not received a dangerous wound, which obliged him to retire. Thus the attack failed on the left, but on the right, the camp of the German reſerve was forced, Col. Breyman killed, and his countrymen defeated with great ſlaughter, and the loſs of all their artillery and baggage. This was by far the heavieſt loſs the Britiſh army had ſuſtained ſince the action at Bunker's Hill. The killed and wounded amounted to near 1,200, excluſive of the Germans; and the Americans had now an opening on the right and rear of the Britiſh forces, ſo that the army was threatened with entire deſtruction. This obliged Gen. Burgoyne once more to ſhift his poſition, that the enemy might alſo be obliged to alter their's: which he did, on the night of the 7th, without any loſs, and all the next day, he continued to offer the enemy battle; but they were now too well aſſured of obtaining a complete victory, to riſk a pitched battle. They advanced on the right ſide, in order to encloſe him entirely; which obliged the general to direct a retreat towards Saratoga. But they had now ſtationed a great force on the ford at Hudſon's-River, ſo that the only poſſibility of retreat was by ſecuring a paſſage to Lake George, which was attempted, but was found impracticable. In this extreme danger, it was reſolved to march by night to Fort-Edward, forcing the paſſages at the fords, either above or below the place. But before this could be done, intelligence was received that the Americans had raiſed ſtrong entrenchments oppoſite to theſe fords, and had taken poſſeſſion of the riſing ground between Fort-George and Fort-Edward. All this time, their army was increaſing, by the arrival of militia and volunteers from all parts; and extended along the oppoſite bank of Hudſon's-River, to obſerve the leaſt movement of the Britiſh army. The force under Gen. Gates, including miliatia and continentals, was 13,222, of whom, however, 2103 were ſick and on furlough, while the army under Gen. Burgoyne ſcarce amounted to 6000; and every part of his camp was reached by the grape and rifle ſhot of the Americans, beſides diſcharges from their artillery. In this ſtate of extreme diſtreſs and danger, the army continued with the greateſt perſeverance, till the 13th of October, when an inventory of proviſions being taken, it was found, that no more remained, than what were ſufficient to ſerve for three days; and a council of war being called, it was unanimouſly determined to treat with the enemy. A negociation was opened next day, which ſpeedily terminated in a capitulation of the whole Britiſh army; the principal article of which was, that the troops were to have a free paſſage to Britain, on condition of not ſerving againſt America during the war. The number of thoſe who ſurrendered at Saratoga, amounted to 5791, the ſick and wounded left in the camp, when the army retreated to Saratoga, to 528; and the number loſt by other accidents ſince the taking of Ticonderoga, to 4161, ſo that the whole royal force, thus annihilated, had originally amounted to 10,480 men. The booty conſiſted of 35 braſs field pieces, 7000 ſtand of arms, clothing for an equal number of ſoldiers, with the tents, military cheſt, &c. Sir Henry Clinton, in the mean time, had ſailed up the North-River, and deſtroyed the forts Montgomery and Clinton, with Fort-Conſtitution, and Continental Village, where were barracks for 2000 men. Seventy large cannon were carried away, beſides a number of ſmaller artillery, and a great quantity of ſtores and ammunition. On this occaſion, the loſs of the Britiſh army was but ſmall, though ſome officers of merit were killed in the different attacks. Another attack was made by Sir James Wallace with ſome frigates, and a body of land forces under Gen. Vaughan. The place which now ſuffered was named Eſopus: the fortifications were deſtroyed, and the town itſelf was reduced to aſhes. But theſe ſucceſſes were now diſregarded by both parties. They ſerved only to irritate the Americans, fluſhed with their ſucceſs; and they were utterly inſufficient to raiſe the ſpirits of the Britiſh, who were now thrown into the utmoſt diſmay.

AMERICA, UNITED STATES OF, HISTORY OF THE WAR WITH, IN 1778, THE TREATY WITH FRANCE, &c. On the 16th of March, 1778, Lord North intimated to the Houſe of Commons that a paper had been laid before the king by the French ambaſſador, intimating the concluſion of an alliance between the court of France and the United States of America. The preliminaries of this treaty had been concluded in the end of the year 1777, and a copy of them ſent to Congreſs, in order to counteract any propoſals that might be made in the mean time by the Britiſh miniſtry. On the 6th of February, 1778, the articles were formally ſigned, to the great ſatisfaction of both French and Americans.

cans. They were in ſubſtance as follows :—1. "If Great-Britain ſhould, in conſequence of this treaty, proceed to hoſtilities againſt France, the two nations ſhould mutually aſſiſt one another.—2. The main end of the treaty was in an effectual manner to maintain the independency of America.—3. Should thoſe places of North-America ſtill ſubject to Britain be reduced by the colonies, they ſhould be confederated with them, or ſubjected to their juriſdiction. 4. Should any of the W.India iſlands be reduced by France, they ſhould be deemed its property.—5. No formal treaty with Great-Britain ſhould be concluded, either by France or America, without the conſent of each other ; and it was mutually engaged that they ſhould not lay down their arms till the independency of the United States had been formally acknowledged.—6. The contracting parties mutually agreed, to invite thoſe powers that had received injuries from Great-Britain, to join the common cauſe.—7. The United States guaranteed to France all the poſſeſſions in the Weſt-Indies which ſhe ſhould conquer ; and France in her turn guaranteed the abſolute independency of the States, and their ſupreme authority over every country they poſſeſſed, or might acquire during the war." The notification of ſuch a treaty was looked upon by Great-Britain as a declaration of war by France, and the adminiſtration of the former kingdom took meaſures accordingly. The Americans in the mean time, aſſiduouſly employed their agents at the courts of Spain, Vienna, Pruſſia and Tuſcany, in order to conclude alliances with them, or at leaſt to procure an acknowledgment of their independency. As it had been reported that Britain intended to apply for aſſiſtance to Ruſſia, the American commiſſioners were enjoined to uſe their utmoſt influence with the German Princes, to prevent ſuch auxiliaries from marching through their territories, and to endeavor to procure the recal of the German troops already ſent to America. To France they offered a ceſſion of ſuch Weſt-India iſlands as ſhould be taken by the united ſtrength of France and America ; and ſhould Britain, by their joint endeavors, be diſpoſſeſſed of Newfoundland, Cape-Breton, and Nova-Scotia, theſe territories ſhould be divided between the two nations, and Great-Britain be totally excluded from the fiſhery. The propoſals to the Spaniſh court were, that in caſe they ſhould eſpouſe their quarrel, the American States ſhould aſſiſt in reducing Penſacola under their dominion, provided their ſubjects were allowed the free navigation of the Miſſiſſippi, and the uſe of the harbour of Penſacola ; and if agreeable to Spain, they would declare war againſt Portugal, ſhould that power expel the American ſhips from its ports. The ſeaſon for action approaching, Congreſs was indefatigable in preparing for a new campaign, which it was thought would be the laſt. On the other hand, the Britiſh army, expecting ſpeedily to be reinforced by 20,000 men, thought of nothing but conluding the war according to their wiſhes, before the end of the campaign. It was with the utmoſt indignation, therefore, that they received the news of Lord North's conciliatory bill, which they looked upon as a national diſgrace ; and ſome even tore the cockades from their hats, and trampled them under their feet as a token of their indignation. By the coloniſts it was received with indifference. The Britiſh commiſſioners endeavored to make it as public as poſſible. Gov. Tryon ſent copies of the bill to Gen. Waſhington, intreating that he would allow them to be circulated ; to which the general returned for anſwer a copy of a newſpaper in which the bill was printed, with the reſolutions of Congreſs upon it. Theſe were, "That whoever preſumed to make a ſeparate agreement with Britain, ſhould be deemed a public enemy ; that the United States could not with any propriety hold correſpondence with the commiſſioners until their independence was acknowledged, and the Britiſh fleets and armies removed from America ; and that the States ſhould not ſuffer themſelves to be deceived into ſecurity by any offers that might be made ; but uſe their utmoſt endeavors to ſend their quotas with all diligence into the field." The individuals with whom the commiſſioners converſed on the ſubject of the conciliatory bill, generally anſwered, that the day of reconciliation was paſt ; and that the haughtineſs of Britain had extinguiſhed all filial regard in the breaſts of the Americans. About this time alſo, Mr. Silas Deane arrived from France, with two copies of the treaty of commerce and alliance to be ſigned by Congreſs. Advices of the moſt agreeable nature were alſo received, repreſenting the favourable diſpoſition of the European powers ; all of whom wiſhed to ſee the independence of America ſettled upon the moſt firm baſis. Conſidering the ſituation of matters with the coloniſts at this time, therefore, it is no wonder that the commiſſioners were unable to accompliſh their errand. Their propoſals were rejected, themſelves treated as ſpies, and all intercourſe with them interdicted.

AMERICA, THE UNITED STATES OF, HISTORY OF THE WAR WITH, IN 1779. Before any final anſwer could be obtained from Congreſs, Sir Henry Clinton had reſolved to evacuate Philadelphia. Accordingly, on the 10th of June, the army marched out of the city and croſſed the Delaware with all its baggage. Gen. Waſhington, appriſed of this, had diſpatched expreſſes into the Jerſeys with orders to collect all the forces that could be aſſembled to obſtruct the march of the enemy. After various movements on both ſides, Sir Henry with the royal army, arrived on the 27th at Freehold ; where, judging that the enemy would attack him, he encamped in a very ſtrong ſituation. Here Gen. Waſhington determined to make an attack as ſoon as the army had begun its march. The night was ſpent in making the neceſſary preparations, and Gen. Lee with his diviſion was ordered to be ready by day-break. The attack was accordingly made ; but the Britiſh general had taken ſuch care to arrange his troops properly, and ſo effectually ſupported his forces when engaged with the Americans, that the latter were with difficulty preſerved from a total defeat by the advance of Gen. Waſhington with the whole army. The Britiſh troops effected their retreat with the loſs of 300 men, of whom many died through mere fatigue. In this action Gen. Lee was charged by Gen. Waſhington with diſobedience of orders, and ſuſpended in the field. After they arrived at Sandy-Hook, a bridge of boats was, by Lord Howe's direction, thrown over the channel, and the troops were conveyed aboard the fleet ; after which they ſailed to New-York. After ſending ſome light detachments to watch the enemy's motions, Gen. Waſhington marched towards the North-River, where a great force had been collected to join him, and where it was now expected that ſome very capital operations would take place. In the mean time, France had been preparing to aſſiſt the Americans. On the 14th of April Count d'Eſtaing had ſailed from Toulon with a ſtrong ſquadron, and arrived on the coaſt of Virginia in the beginning of July, while the Britiſh fleet was employed in conveying the forces from Sandy-Hook to New-York. It conſiſted of one ſhip of 90 guns, one of 80, ſix of 74, and four of 64, beſides ſeveral large frigates; and, excluſive of its complement of ſailors, had 6000 marines and ſailors on board. To oppoſe this, the Britiſh had only ſix ſhips of 64 guns, three of 50, and two of 40, with ſome frigates and ſloops. Notwithſtanding this inferiority, the Britiſh Admiral poſted himſelf ſo advantageouſly, that d'Eſtaing did not think proper to attack him. He, therefore, remained at anchor four miles off Sandy-Hook till the 22d of July, without effecting any thing more than the capture of ſome veſſels, which through ignorance of his arrival, fell into his hands. The next attempt of the French admiral was, in conjunction with the Americans, on Rhode-Iſland. It was propoſed that d'Eſtaing, with his 6000 troops, ſhould make a deſcent on the S. part of the Iſland, while a body of the Americans ſhould take poſſeſſion of the N. while the French ſquadron was to enter the harbour of Newport, and take or deſtroy the Britiſh ſhipping. On the 8th of Auguſt the Count entered the harbour, but found himſelf unable to do any material damage. Lord Howe inſtantly ſet ſail for Rhode-Iſland, and d'Eſtaing, confiding in his ſuperiority, immediately came out of the harbour to attack him. A violent ſtorm parted the two fleets, and did ſo much damage that they were rendered totally unfit for action. The French, however, ſuffered moſt; and ſeveral of their ſhips being afterwards attacked ſingly by the Britiſh, narrowly eſcaped being taken. On the 20th of Auguſt he returned to Newport in a very ſhattered condition, and ſailed two days after for Boſton. Gen. Sullivan had landed in the mean time on the northern part of Rhode-Iſland with 10,000 men. On the 17th Auguſt, they began their operations by erecting batteries, and making their approaches to the Britiſh lines. But Gen. Pigot had taken ſuch effectual care to ſecure himſelf on the land ſide, that without the aſſiſtance of a marine force it was impoſſible to attack with any probability of ſucceſs. The conduct of d'Eſtaing, therefore, who had abandoned them when maſter of the harbour, gave the greateſt diſguſt to the people of New-England, and Sullivan began to think of a retreat; but the garriſon ſallied out upon him with ſo much vigour, that it was not without difficulty that he effected it. He had not been long gone when Sir Henry Clinton arrived with a body of 4000 men; which, had it arrived ſooner, would have enabled the Britiſh commander to have gained a deciſive advantage over him. The firſt Britiſh expedition was to Buzzard's Bay; where they deſtroyed a great number of privateers and merchantmen, magazines, with ſtorehouſes, &c. whence proceeding to Martha's Vineyard, they carried off 10,000 ſheep and 300 black cattle. Another expedition took place up the North-River, under Lord Cornwallis and Gen. Knyphauſen; the principal event of which was the deſtruction of a regiment of American cavalry, known by the name of Waſhington's Light-horſe. A third was directed to Little-Egg Harbour in New-Jerſey, a place noted for privateers, the deſtruction of which was its principal intention. It ended in the deſtruction of the enemy's veſſels, as well as of the place itſelf. At the ſame time part of another body of American troops, called Pulaſki's Legion, was ſurpriſed, and a great number of them put to the ſword. The Americans had in the beginning of the year projected the conqueſt of Weſt-Florida; and one Capt. Willing, with a party of reſolute men, had made a ſucceſsful incurſion into the country. This awakened the attention of the Britiſh to the ſouthern colonies, and an expedition againſt them was reſolved on. Georgia was the place of deſtination; and the more effectually to enſure ſucceſs, Col. Campbell, with a ſufficient force, under convoy of ſome ſhips of war, commanded by Commodore Hyde Parker, embarked at New-York; while Gen. Prevoſt, who commanded in Eaſt-Florida, was directed to ſet out with all the force he could ſpare. The armament from New-York arrived off the coaſt of Georgia in December; and though the enemy was ſtrongly poſted in an advantageous ſituation, the Britiſh troops made good their landing, and advanced towards Savannah; where they defeated the Americans, and took poſſeſſion of the town. In ten days the whole province of Georgia was reduced, Sunbury alone excepted; and this was alſo brought under ſubjection by Gen. Provoſt in his march northward. Every proper method was taken to ſecure the tranquility of the country; and rewards were offered for apprehending committee and aſſembly men, and ſuch as they judged moſt inimical to the Britiſh intereſts. The conqueſt of Carolina was next projected. In this attempt there was no ſmall probability of ſucceſs. The country contained a great number of friends to government, who now eagerly embraced the opportunity of declaring themſelves; and many of the inhabitants of Georgia had joined the royal ſtandard; and there was not in the province any conſiderable body of republican forces, capable of oppoſing the efforts of well-diſciplined troops. On Gen. Provoſt's approach, the royaliſts aſſembled in a body, imagining themſelves able to ſtand their ground until their allies ſhould arrive; but in this they were diſappointed. The Americans attacked and defeated them with the loſs of half their number. The remainder retreated into Georgia; and after undergoing many difficulties, at laſt effected a junction with the Britiſh forces. Mean time, Gen. Lincoln, with a conſiderable body of American troops, had encamped within 20 miles of Savannah; and another ſtrong party had poſted themſelves at *Briar's Creek*. Thus the extent of the Britiſh government was likely to be circumſcribed within very narrow bounds. Gen. Prevoſt therefore determined to diſlodge the party at Briar's Creek: and the latter, truſting to their ſtrong ſituation, and being remiſs in their guards, ſuffered themſelves to be ſurpriſed on the 30th of March, 1779; when they were routed with the loſs of 400 killed and taken, beſides a great number drowned in the river or the ſwamps. Their whole artillery, ſtores, baggage, and almoſt all their arms, were taken, and thus Georgia ſeemed for the preſent to be entirely ſubjected to the Britiſh. This victory proved of conſiderable ſervice to the royal cauſe. Great numbers of the loyaliſts joined the army, and conſiderably increaſed its force. Hence, Gen. Prevoſt was enabled to ſtretch poſts further up the river, and to guard all the principal paſſes: ſo that Gen. Lincoln was reduced to a ſtate of inaction; and at laſt moved off towards

Auguſta, to protect the aſſembly, which was obliged to ſit in that place, the capitol being now in the hands of the Britiſh. Lincoln had no ſooner quitted his poſt, than it was judged a proper time by the Britiſh general to put in execution the grand ſcheme which had been meditated againſt Carolina. The Savannah was ſo ſwelled by the exceſſive rains, that it ſeemed impaſſable; the oppoſite ſhore was full of ſwamps and marſhes, and, to render the paſſage ſtill more difficult, Gen. Moultrie was left with a conſiderable body of troops to oppoſe the enemy's attempts. But in ſpite of every oppoſition, Gen. Moultrie was defeated, and obliged to retire towards Charleſton; and the victorious army, after having waded through the marſhes for ſome time, arrived in an open country, through which they purſued their march with great rapidity towards the capital; while Gen. Lincoln remained in a ſtate of ſecurity at Auguſta, imagining that the obſtacles he had left in the way could not be ſurmounted. Intelligence of the danger to which Charleſton was expoſed, at laſt rouſed the American General from his lethargy. A choſen body of infantry, mounted on horſeback for the greater expedition, was diſpatched before him; while Lincoln himſelf followed with all the forces he could collect. Gen. Moultrie too, had taken poſſeſſion of all the avenues leading to Charleſton, and prepared for a vigorous defence. But the Americans were defeated in every encounter; and retreating continually, allowed the Britiſh army to come within cannon ſhot of Charleſton on the 12th of May. The town was now ſummoned to ſurrender, and the inhabitants would gladly have agreed to obſerve a neutrality during the reſt of the war, and would have engaged alſo for the province. But theſe terms not being accepted, they made preparation for a vigorous defence. It was not, however, in the power of the Britiſh commanner at this time to make an attack with any proſpect of ſucceſs. His artillery was not of ſufficient weight; there were no ſhips to ſupport his attack by land; and Gen. Lincoln advancing rapidly with a ſuperior army, threatened to incloſe him between his own force and the town; therefore he withdrew his forces, and took poſſeſſion of St, James' and St. John's iſlands; where having waited ſome time, his force was augmented by the arrival of two frigates. With theſe he determined to make himſelf maſter of Port Royal, another iſland poſſeſſed of an excellent harbour, and from its ſituation commanding all the ſea coaſt from Charleſton to Savannah river; which, after conſiderable oppoſition, Gen. Prevoſt took poſſeſſion of, and put his troops into proper ſtations, waiting for the arrival of ſuch reinforcements as were neceſſary for the intended attack on Charleſton. Mean time Count d'Eſtaing had uſed his utmoſt efforts to ingratiate himſelf with the inhabitants of Boſton. Zealous alſo in the cauſe of his maſter, he had publiſhed a proclamation to be diſperſed through Canada, inviting the people to return to their original friendſhip with France, and declaring, that all who renounced their allegiance to Great-Britain ſhould certainly find a protector in the king of France. All his endeavours, however, proved inſufficient at this time to produce any revolution, or even to form a party of any conſequence among the Canadians. As ſoon as the Count had refitted his fleet, he took the opportunity, while that of Admiral Byron had been ſhattered by a ſtorm, of ſailing to the Weſt-Indies; but ſoon returned and directed his courſe towards Georgia, with a deſign to recover that province out of the hands of the Britiſh, and to put it, as well as S. Carolina, in ſuch a poſture of defence, as would effectually ſecure them from any future attack. He accordingly arrived off the coaſt of Georgia with a fleet of 22 ſail of the line and 10 large frigates. His arrival was ſo little expected, that ſeveral veſſels, laden with proviſions and military ſtores fell into his hands; the Experiment alſo, a veſſel of 50 guns, commanded by Sir James Wallace, was taken after a ſtout reſiſtance. On the continent, the Britiſh troops were divided. Gen. Prevoſt, with an inconſiderable part, remained at Savannah, but the main force was under Colonel Maitland at Port Royal. On the firſt appearance of the French fleet, an expreſs was diſpatched by Col. Maitland: but it was intercepted; ſo that before he could ſet out in order to join the commander in chief, the Americans had ſecured moſt of the paſſes by land, while the French fleet effectually blocked up the paſſage by ſea. But, by taking advantage of creeks and inlets, and marching over land, he arrived juſt in time to relieve Savannah. D'Eſtaing, after making a gaſconade of what had happened at St. Vincents and Grenada, had allowed Gen. Prevoſt 24 hours to deliberate whether he would capitulate or not. This time the genetal employed in making the beſt preparations he could for a defence; and during this interval Col. Maitland arrived. D'Eſtaing's ſummons was rejected. The garriſon conſiſted of 3000 men, of approved valour and experience, while the united force of the French and Americans amounted to 10,000. The event was anſwerable to the expectation of the Britiſh general. Having the advantage of a ſtrong fortification and excellent engineers, the fire of the allies made ſo little impreſſion, that d'Eſtaing reſolved to bombard the town, and a battery of nine mortars was erected for the purpoſe. A general aſſault was accordingly attempted on the 9th October; but the aſſailants were every where repulſed with ſuch ſlaughter, that 1200 were killed and wounded; among the former were Count Polaſki, and among the latter d'Eſtaing himſelf. This diſaſter entirely overthrew the ſanguine hopes of the Americans and French; and after waiting eight days longer, both parties prepared for a retreat; the French to their ſhipping, and the Americans into Carolina. While the allies were thus unſucceſsfully employed in the Southern States, their antagoniſts were no leſs aſſiduous in diſtreſſing them in the northern parts. Sir George Collier was ſent with a body of land forces, into the province of Virginia. Their firſt attempt was on the town of Portſmouth, where though the Americans had deſtroyed ſome ſhips of great value, the Britiſh troops arrived in time to ſave a great number of others. On this occaſion about 120 veſſels of eifferent ſizes were burnt. and 20 carried off; and an immenſe quantity of proviſions, deſigned for the uſe of gen. Waſhington's army, was either deſtroyed or carried off, together with a great variety of naval and military ſtores. The fleet and army returned with little loſs to New-York. This ſucceſs gave encouragement to attempt another expedition. The Americans had for ſome time been employed in the erection of two ſtrong forts on the river; Verplank's Neck on the E. and at Stoney Point on the W. ſide. Theſe when completed would have been of the utmoſt ſervice to the Americans, as commanding the principal paſs, called the *King's Ferry*, between the northern and ſouthern colonies. It was therefore determined to attack them before the works ſhould be completed. The force employed on this occaſion was divided into two bodies; one of which directed its courſe againſt Verplanks, and the other againſt Stoney Point. The former was commanded by Gen. Vaughan, the latter by Gen. Pattiſon, while the ſhipping was under the direction of Sir George Collier. Gen. Vaughan met with no reſiſtance, the enemy abandoning their works, and ſetting fire to every thing combuſtible that they could not carry off. At Stoney Point, however, a vigorous defence was made, though the garriſon was obliged at laſt to capitulate upon honourable conditions. To ſecure the poſſeſſion of this laſt, which was the more important of the two, Gen. Clinton removed from his former ſituation, and encamped in ſuch a manner that Waſhington could not give any aſſiſtance. The Americans, however, revenged themſelves by diſtreſſing, with their numerous privateers, the trade of New-York. This occaſioned a third expedition to Connecticut, where theſe privateers were chiefly built and harboured. The command was given to Gov. Tryon and to Gen. Garth, an officer of known valour and experience. They landed at Newhaven, where they demoliſhed the batteries that had been erected to oppoſe them, and deſtroyed the ſhipping and naval ſtores; but they ſpared the town, as the inhabitants had not fired out of their houſes upon the troops. From Newhaven they marched to Fairfield, Norwalk, and Greenfield, all of which they reduced to aſhes. Theſe ſucceſſes proved very alarming as well as detrimental to the Americans; ſo that Gen. Waſhington determined at all events to drive the enemy from Stoney Point. For this purpoſe he ſent Gen. Wayne with a detachment of choſen men, to attempt the recovery of it by ſurpriſe. On this occaſion the Americans ſhowed a ſpirit exceeding any thing they had evinced during the courſe of the war. Though, after the capture of it by the Britiſh, the fortifications of this place had been made very ſtrong, they attacked them with bayonets, and after paſſing through a heavy fire of muſquetry and grape ſhot, obliged the ſurviving part of the garriſon, amounting to 500 men, to ſurrender. They next projected another expedition of great importance againſt the poſt on the river Penobſcot, of which the Britiſh had lately taken poſſeſſion, and where they had begun to erect a fort which threatened to be a very great inconvenience to the coloniſts. But in this they were prevented, by Sir George Collier with a Britiſh fleet ſailing up the river to attack them; on which they inſtantly embarked their artillery and military ſtores, but were ſo cloſely purſued, that not a ſingle veſſel eſcaped of the whole fleet, conſiſting of 19 armed veſſels and 24 tranſports being deſtroyed; moſt of them indeed blown up by themſelves. Thus the united arms of America and France being almoſt every where unſucceſsful, the independency of the States ſeemed ſtill to be in danger, when further encouragement was given by the acceſſion of Spain to the confederacy, June 1779. The firſt effect of this appeared in an invaſion of Weſt-Florida by the Spaniards in September, 1779. As the country was in no ſtate of defence, they eaſily made themſelves maſters of it. Their next enterprize was againſt the Bay of Honduras, where the Britiſh logwood cutters were ſettled. Theſe, finding themſelves too weak to reſiſt, applied to the governor of Jamaica for relief; who ſent them a ſupply of men, ammunition, and military ſtores, under Capt. Dalrymple. In his way, Capt. Dalrymple fell in with a ſquadron from Adm. Parker in ſearch of ſome regiſter ſhips richly laden; [illegible] which retreating into the harbour of Omoa, were too ſtrongly protected to be attacked with ſafety. A project was then formed, in conjunction with the people of Honduras, to reduce this fort; but the fortifications were ſo ſtrong, that the artillery they had brought along with them were too light to make any impreſſion.—It was then determined to try the ſucceſs of an eſcalade; and this was executed with ſo much ſpirit, that the Spaniards immediately threw down their arms and ſurrendered. The ſpoil was immenſe, being valued at three millions of dollars. A ſmall garriſon was left for the defence of the place; but it was quickly attacked by a ſuperior force, and obliged to evacuate it, though not without deſtroying every thing that could be of uſe to the enemy. As no operations of any conſequence took place this year in the province of New-York, the Congreſs diſpatched Gen. Sullivan with a conſiderable force, to take vengeance on the Indians for their depredations. Of this the Indians were appriſed, and collecting all their ſtrength, reſolved to come to a deciſive engagement. Accordingly they took a ſtrong poſt in the moſt woody and mountainous part of the country; erecting a breaſt-work in their front of large logs of wood extending half a mile in length, while their right flank was covered by a river, and the left by a hill of difficult acceſs. This advantageous poſition they had taken by the advice of the refugees who were among them, and of whom 2 or 300 were in the battle. Thus poſted, the Indians waited the approach of the American army: but the latter having brought ſome artillery along with them, played it againſt the breaſt-work with ſuch ſucceſs, that in two hours it was almoſt deſtroyed; and a party having reached the top of the hill, they became apprehenſive of being ſurrounded, on which they inſtantly fled with precipitation. The Americans after this battle met with no further reſiſtance, but were ſuffered to execute in the moſt ample manner the vengeance they had projected. Upon entering the country of the Indians, it appeared that they had been acquainted with agriculture and the arts of peace far beyond what had been ſuppoſed. The whole of this fine country was now, however, converted into a deſart. Forty towns and ſettlements, beſides ſcattered habitations, were demoliſhed; the fields of corn, the orchards, the plantations, were utterly laid waſte; all the fruit trees were cut down; and the quantity of corn waſted on this occaſion was ſuppoſed to amount to 160,000 buſhels.

AMERICA, THE UNITED STATES OF, HISTORY OF THE WAR WITH, IN 1780. We muſt now take a view of the tranſactions in the ſouthern colonies; to which the war was, in the year 1780, ſo effectually transferred, that the operations there became at laſt deciſive. The ſucceſs of Gen. Prevoſt in advancing to the very capital of South Carolina has been already related. Towards the end of 1779, Sir Henry Clinton ſet ſail from New-York with a conſiderable body of troops, for the attack of Charleſton, in a fleet of ſhips of war and tranſports under the command of Vice-Admiral Arbuthnot. After a tedious and dangerous voyage, wherein ſeveral tranſports were loſt, with the greater part of the horſes, and an ordnance ſhip, they arrived at Savannah, where they endeavoured to repair their damages ; and proceeded on the 10th of February 1780, to North Ediſto, the place of debarkation appointed. They had a ſpeedy paſſage, the tranſports all entered the harbour the next day ; and the army took poſſeſſion of John's Iſland without oppoſition. Preparations were then made for paſſing the ſquadron over Charleſton bar, where the high-water ſpring-tides were only 19 feet deep ; but they did not get into the harbour till the 20th of March, when it was effected without any accident, though the American galleys attempted to prevent them. The Britiſh troops had previouſly removed from John's to Jame's Iſland ; and on the 29th they effected their landing on Charleſton neck.—On the firſt of April they broke ground within 800 yards of the American works ; and by the 8th their guns were mounted. As ſoon as the army began to erect their batteries againſt the town, Admiral Arbuthnot embraced the firſt opportunity of paſſing Sullivan's Iſland, upon which there was a ſtrong fort of batteries, with the Roebuck, Richmond, Romulus, Blonde, Virginia, Raleigh, and Sandwhich armed ſhips, the Renown bringing up the rear ; and paſſing through a ſevere fire, anchored in about two hours under James's Iſland, with the loſs of 27 ſeamen killed and wounded. The ſhips in general ſuſtained damage in their maſts and rigging, though not materially in their hulls : but the Acetus tranſport, having on board ſome naval ſtores, grounded within gun-ſhot of Sullivan's Iſland, and received ſo much damage that ſhe was obliged to be abandoned and burnt. On the 10th Sir Henry Clinton and Admiral Arbuthnot ſummoned the town to ſurrender ; but Gen. Lincoln, who commanded in Charleſton, reſolved to defend the place. The batteries were now opened againſt the town ; and from their effect the fire of the American advanced works conſiderably abated. The number of troops under Lincoln were by far too few for defending works of ſuch extent as thoſe of Charleſton ; and many of the men were little accuſtomed to military ſervice, and ill provided with clothes and other neceſſaries. Lincoln had been for ſome time expecting ſupplies and reinforcements from Virginia, but they came in very ſlowly ; and Earl Cornwallis, and Lieut. Col. Tarleton, were extremely active in intercepting them. They defeated a conſiderable body of cavalry and militia which was proceeding to the relief of the town ; and made themſelves maſters of ſome poſts which gave them the command of the country, by which means great ſupplies of proviſions fell into their hands. For Sullivan had alſo been taken by the king's troops, when on the 18th of May, Gen. Clinton again ſummoned the town to ſurrender ; an offer being made, as had been done before, that if they ſurrendered, the lives and property of the inhabitants ſhould be preſerved. Articles of capitulation were then propoſed by Gen. Lincoln ; but the terms were not agreed to by Gen. Clinton. At length, however, the town being cloſely inveſted on all ſides, Gen. Lincoln, at the intreaty of the inhabitants, ſurrendered it on Gen. Clinton's terms, one month and two days after it had been firſt ſummoned. A large quantity of ordnance, arms, and ammunition, was found in Charleſton ; and, 2487 continental troops, beſides militia, taken priſoners. Several American frigates were alſo taken or deſtroyed in the harbour. The loſs of Charleſton excited a conſiderable alarm in America ; and their popular writers, particularly the author of the celebrated performance intitled Common Senſe, made uſe of it as a powerful argument to lead them to more vigorous exertions againſt Great-Britain, that they might the more effectually and certainly ſecure their independence. Meantime, however, the garriſon at New-York were not free from apprehenſions for their own ſafety. An intenſe froſt, accompanied with great falls of ſnow, began about the middle of December 1779, and ſhut up the navigation of the port of New-York from the ſea, within a few days after the departure of Admiral Arbuthnot and Gen. Clinton. The ſeverity of the weather increaſed ſo much, that in the middle of January all communication with N. York by water was entirely cut off, and as many new ones opened by the ice. The paſſage in the North River, even in the wideſt part, from New-York to Paulus Hook, was, about the 19th of January, paſſable by the heavieſt cannon ; an event which had been unknown in the memory of man. Proviſions were ſoon after tranſported upon ſledges, and a detachment of cavalry marched upon the ice from New-York to Staten Iſland, being a diſtance of 9 or 10 miles. The city of New-York, thus circumſtanced, was expoſed to the attacks from the continental troops : And it was reported that Gen. Waſhington was meditating a great ſtroke upon it with his whole force, by different attacks. Gen. Pattiſon, commandant at New-York, iſſued a proclamation, calling upon all the male inhabitants from 16 to 60, to take up arms. The requiſition was readily complied with, the inhabitants being generally in favour of the royal cauſe, and the city was put into a very ſtrong poſture of defence. No attack, however, was made upon New-York ; but an attempt was made upon Staten-Iſland, where there were about 1800 men who were well intrenched. Gen. Waſhington, whoſe army was hutted at Morris-Town, ſent a detachment of 1700 men, with ſix pieces of cannon, two mortars, and ſome horſes, commanded by Lord Sterling, who arrived at Staten-Iſland early in the morning of the 15th January. The advanced poſts of the Britiſh troops retired upon the approach of the Americans, who formed the line, and made ſome movements in the courſe of the day ; but they withdrew in the night, after having burnt one houſe, pillaged ſome others, and carried off with them about 200 head of cattle. Immediately on the arrival of the Americans on Staten-Iſland, Lieut. Gen. Knyphauſen had embarked 600 men to attempt a paſſage, but the floating ice compelled them to return. It is, however, imagined, that the appearance of theſe tranſports with the Britiſh troops on board, which the Americans could ſee towards the cloſe of the day, induced the latter to make ſo precipitated retreat. After Charleſton had ſurrendered Gen. Clinton iſſued two proclamations, and many hand-bills among the inhabitants of South-Carolina, to induce them to return to their allegiance, and to join the king's troops. The proclamations and publications were well expreſſed, and appear to have produced ſome effect ; though they probably operated chiefly upon thoſe who were before not much inclined to American independence. Of the inhabitants of Charleſton, 210 ſigned an addreſs to Gen. Clinton and Admiral Arbuthnot, ſoliciting to be re-admitted to the character of Britiſh ſubjects, (the inhabitants having been hitherto conſidered as priſoners on parole,) declaring their diſapprobation of American independence; and expreſſing their regret, that after the repeal of theſe ſtatutes which gave riſe to the troubles in America, the ovatures made by his Majeſty's commiſſioners had not been regarded by the Congreſs. Meantime the ravages of war did not prevent the Americans from paying attention to the arts of peace.— On the 4th of May an act was paſſed by the Council and Houſe of Repreſentatives of Maſſachuſetts Bay, for incorporating and eſtabliſhing a ſociety for the cultivation and promotion of the arts and ſciences. The Congreſs alſo reſolved that they ſhould continue to meet in Philadelphia, and a committee was appointed to report a proper place where buildings might be provided for the reception of Congreſs, with an eſtimate of the expence of providing ſuch buildings. They likewiſe reſolved to erect a monument to the memory of their late general, Richard Montgomery, who fell at Quebec, with an inſcription expreſſive of his amiable character and heroic atchievements. It was alſo reſolved by the Congreſs, that a court ſhould be eſtabliſhed for the trial of appeals from the Court of Admiralty of the United States of America, in caſes of capture; and that the trials in this court ſhould be determined by the uſages of nations, &c. The difficulties of the Congreſs, and of the people of America, had been greatly increaſed by the depreciation of their paper currency. When the colonies engaged in the war with Great-Britain, they had no regular civil governments eſtabliſhed among them of ſufficient energy to enforce the collection of taxes, or to provide funds for the redemption of ſuch bills of credit, as their neceſſities obliged them to iſſue. Of conſequence their bills increaſed in quantity far beyond the ſum neceſſary for the purpoſe of a circulating medium; and as they wanted ſpecific funds to reſt on for their redemption, they ſaw their paper currency daily ſink in value. The depreciation continued by a kind of gradual progreſſion, from 1777 to 1780; ſo that, at the latter period, the continental dollars were paſſed, by common conſent, in moſt parts of America, at the rate of at leaſt 39-40ths below their nominal value.— The cauſe of the Americans appears alſo to have ſuffered ſomewhat by their depending too much on temporary enliſtments. But the Congreſs endeavoured, towards the cloſe of 1780, to put their army on a more permanent footing, and to give all the ſatisfaction to their officers and ſoldiers which their circumſtances would permit. They appointed a committee for arranging their finances, & made ſome new regulations reſpecting their war-office, treaſury-board, and other public departments. Notwithſtanding all theſe diſadvantages, ſtill the Americans entertained no doubts but that they ſhould be able to maintain their independency.— On the 10th July, M. Ternay, with a fleet of 7 ſhips of the line, beſides frigates, and a large body of French troops, commanded by the Count de Rochambeau, arrived at Rhode Iſland; and the following day 6000 men were landed. A committee from the General Aſſembly at New-York were appointed to congratulate the French General upon his arrival; whereupon he returned for anſwer, "that the king his maſter had ſent him to the aſſiſtance of his good and faithful allies the United States of America: That at preſent he had only brought over the van-guard of a much greater force deſtined for their aid: That the king had ordered him to aſſure them, that his whole power ſhould be exerted for their ſupport; and that the French troops were under the ſtricteſt diſcipline; and, acting under the orders of General Waſhington, would live with the Americans as their brethren." A ſcheme was ſoon after formed, of making a combined attack, with Engliſh ſhips and troops, under the command of Sir Henry Clinton and Admiral Arbuthnot, againſt the French fleet and troops at Rhode-Iſland; but after embarking part of the troops, it was relinquiſhed as impracticable. An unſucceſsful attempt was alſo made in the Jerſeys by General Knyphauſen, with 7000 Britiſh troops, to ſurpriſe the advanced poſts of Gen. Waſhington's army. They proceeded very rapidly towards Springfield, meeting with little oppoſition till they came to the bridge there, which was very gallantly defended by 170 continental troops, for 15 minutes, againſt the Britiſh army: But they were at length obliged to give up ſo unequal a conteſt, with the loſs of 37 men. After ſecuring this paſs, the Britiſh troops marched into the place, and ſet fire to moſt of the houſes. They alſo committed ſome other acts of the moſt wanton barbarity, but were at laſt obliged to return without effecting any thing material. But in South Carolina, the royal arms were attended with more ſucceſs. Earl Cornwallis obtained a ſignal victory over Gen. Gates on the 16th of Auguſt. The action began at break of day, in a ſituation very advantageous for the Britiſh troops, but very unfavourable to the Americans. The latter were much more numerous; but the ground on which both armies ſtood was narrowed by ſwamps on the right and left, ſo that the Americans could not properly avail themſelves of their ſuperior numbers. The Britiſh troops either kept up a conſtant fire, or made uſe of bayonets, as opportunities afforded; and after an obſtinate reſiſtance, for three quarters of an hour, threw the Americans in confuſion, and forced them to give way in all quarters. The continental troops appear to have behaved well, but the militia were ſoon broken. The loſs of the Americans was very conſiderable: about 1000 priſoners were taken, and more are ſaid to have been killed and wounded, but the number is not accurately aſcertained. Seven pieces of braſs cannon, a number of colours, and all the ammunition waggons of the Americans, were alſo taken. Lieut. Col. Tarleton, who had diſtinguiſhed himſelf in this action, was detached the following day, with ſome cavalry and light infantry, amounting to about 350 men, to attack a corps of Americans under General Sumpter. He executed this ſervice with great activity and military addreſs; and, by concealed marches, ſurpriſed him in the middle of the day on the 18th, near the Catawba fords. He totally diſperſed his detachment, which conſiſted of 700 men, killing 150 on the ſpot, and taking two pieces of braſs cannon, 300 priſoners, and 44 waggons. Not long after theſe events, means were found to detach Gen. Arnold from the cauſe of America. Major Andre, adjutant-general to the Britiſh army, was a principal agent in this tranſaction: or, if the ovature of joining the king's troops came firſt from Arnold, this gentleman was the perſon employed to concert the affair with him. More muſt have been originally comprehended in the ſcheme than the mere deſertion of the American cauſe by Arnold: but, whatever deſigns had been formed for promoting the views of the Britiſh government, they were fruſtrated by the apprehending of Major Andre. He was taken in diſguiſe, after having aſſumed a falſe name, on the 23d of September, by three American ſoldiers ; to whom he offered conſiderable rewards to let him eſcape, but without effect. General Waſhington referred his caſe to the deciſion of a board of general officers, who determined that he ought to be conſidered as a ſpy from the enemy ; in conſequence of which, he was on the 2d of October, executed agreeably to the law and uſage of nations. When Arnold learnt that Major Andre was ſeized, he got on board a barge, and eſcaped to one of the king's ſhips, and, as a reward for his deſertion, was made a brigadier-general in the king's ſervice. After the defeat of Gen. Gates, by Earl Cornwallis, that nobleman exerted himſelf to the utmoſt, in extending the progreſs of the Britiſh arms, and with conſiderable effect. But one enterprize, conducted by Major Ferguſon, proved unſucceſsful. That officer had taken abundant pains to diſcipline ſome of the Tory militia, as they were termed, and with a party of theſe, and ſome Britiſh troops, amounting in the whole to about 1400 men, made incurſions into the country. But on the 7th October, he was attacked by a ſuperior body of Americans, at King's Mountain, and totally defeated. There were 150 killed in the action ; 810 made priſoners, and 1500 ſtand of arms were taken by the Americans, whoſe loſs was inconſiderable. On the 3d of September, the Mercury, a Congreſs packet, was taken by the Veſtal, Capt. Keppel, near Newfoundland ; with Mr. Laurens, late preſident of the Congreſs, who was bound on an embaſſy to Holland. He had thrown his papers overboard, but great part of them were recovered, without having received much damage. He was brought to London, examined before the privy council, and committed cloſe priſoner to the Tower, on a charge of high treaſon. His papers were delivered to the miniſtry, and contributed to facilitate a rupture with Holland, as among them was found the ſketch of a treaty of amity and commerce, between the republic of Holland, and the United States of America.

America, the United States of, history of the war with, in 1781. At the beginning of 1781, an affair happened in America, from which expectations were formed by Sir Henry Clinton, that conſiderable advantage might be derived to the royal cauſe. The continuance of the war, and the difficulties under which the Congreſs laboured, had prevented their troops from being properly ſupplied with neceſſaries and convenience. In conſequence of this, on the firſt of January, the American troops at Morriſtown, who formed the Pennſylvania line, in number about 1300, declared, that they would ſerve no longer, unleſs their grievances were redreſſed, as they had not received their pay, or been furniſhed with the neceſſary clothing or proviſions. A riot enſued, in which an officer was killed, and 4 wounded. They then collected the artillery, ſtores, proviſions, and waggons, and marched out of the camp ; on the 2d they went to Middlebrook, and on the 3d, fixed their quarters at Princetown. Intelligence of this ſoon reached New-York. A large body of Britiſh troops were immediately ordered to hold themſelves in readineſs to move on the ſhorteſt notice, it being hoped, that the American revolters might be induced to join the Royal army. Meſſengers were ſent to them from Gen. Clinton, acquainting them, that they ſhould directly be taken under the protection of the Britiſh government ; and that the pay due to them from the Congreſs ſhould be faithfully paid them, without any expectation of military ſervice, unleſs it ſhould be voluntary, upon their laying down their arms and returning to their allegiance. Theſe propoſitions were rejected with diſdain ; and they even delivered up two of Sir Henry Clinton's meſſengers to the Congreſs. Joſeph Reed, Eſq. preſident of Pennſylvania, afterwards repaired to them at Prince-Town, and an accommodation took place : ſuch of them as had ſerved out their full time, were permitted to return home, and others again joined the American army, upon receiving ſatisfactory aſſurances, that their grievances ſhould be redreſſed. Lord Cornwallis now began to make vigorous exertions, to penetrate into North-Carolina, and on the 11th, his army was in motion, and advancing towards that province ; but was retarded, by an attempt made by the Americans, under Gen. Morgan, to make themſelves maſters of the diſtrict of Ninety-ſix. To prevent this, Lord Cornwallis detached Lieut. Col. Tarleton, with 300 cavalry, 500 light infantry, the 7th regiment, the firſt battalion of the 7th regiment, and 2 three pounders, to oppoſe the progreſs of Morgan. The Britiſh troops came up with the Americans, on the 17th January. The Americans were drawn up in an open wood, and having been lately joined by ſome militia, were more numerous than the Britiſh, but the latter were better diſciplined. The Americans ſoon gave way, and their militia quitted the field ; upon which, the royal troops, ſuppoſing the victory already gained, engaged with ardour in the purſuit, and were thereby thrown into diſorder. Gen. Morgan's corps, who were ſuppoſed to have been routed, immediately faced about, and threw in a heavy fire upon the king's troops, which occaſioned the utmoſt confuſion amongſt them ; and they were at length totally defeated. Of the Britiſh infantry, 400 were either killed, wounded, or taken priſoners : the loſs of the cavalry was leſs, but the 2 three pounders fell into the hands of the Americans, together with the colours of the 7th regiment ; and all the royal artillery were either killed or wounded in defence of their colours.—He then retreated to Hamilton's Ford, near the mouth of Bullock's Creek, carrying with him part of his baggage, and deſtroying the remainder. This defeat of the troops under Tarleton, was a ſevere ſtroke to Lord Cornwallis, as the loſs of his light infantry was a great diſadvantage to him. The day after he employed in collecting the remains of Tarleton's corps, and in endeavouring to form a junction with Gen. Leſly. Conſiderable exertions were then made by part of the army, to retake the priſoners, and to intercept Gen. Morgan's corps on its retreat to the Catawba.—But that officer, after his defeat of Tarleton, had marched up into the country, and croſſed the Catawba, the evening before a great rain, which ſwelled the river to ſuch a degree, as to prevent the royal army from croſſing for ſeveral days ; during which, the Britiſh priſoners got over the Yadkin ; whence they proceeded to Dan River, which they alſo paſſed, and on the 14th of February had reached Virginia.—Lord Cornwallis employed two days in collecting flour, and in deſtroying ſuperfluous baggage, and all his waggons, excepting thoſe laden with hoſpital ſtores, ſalt, and ammunition, and four empty ones for ſick or wounded. Being thus freed from all unneceſſary incumberances, he marched thro'

North Carolina with great rapidity, and penetrated to its remoteſt extremities, on the banks of the Dan. His progreſs was ſometimes impeded by parties of the militia, and ſkirmiſhes enſued, but he met with no conſiderable oppoſition. On the firſt of February, the king's troops croſſed the Catawba at M'Cowan's Ford, where General Gavidſon, with a party of militia, was poſted, to oppoſe their paſſage; but he falling by the firſt diſcharge, the royal troops made good their landing. When Lord Cornwallis arrived at Hillſborough, he erected the king's ſtandard, and invited all royal ſubjects to repair to it, and take an active part in aſſiſting his Lordſhip to reſtore order and government. He had been taught to believe, that the king's friends were numerous in that part of the country; but the event did not confirm theſe repreſentations. Meanwhile, Gen. Greene was marching with great expedition, with the troops under his command, to form a junction with other corps of Americans, that he might be able to impede the progreſs of Lord Cornwallis. In other places, ſome conſiderable advantages were obtained by the royal arms. On the fourth of January, ſome ſhips of war, with a number of tranſports, on board of which was a large body of troops, under the command of Gen. Arnold, arrived at Weſtover, about 140 miles from the Capes of Virginia, where the troops immediately landed, and marched to Richmond, which they reached without oppoſition, the militia having retreated on their approach.—Lieut. Col. Simcoe marched hence with a detachment of Britiſh troops to Weſtham, where they deſtroyed one of the fined foundery for cannon in America, and a large quantity of ſtores. Gen. Arnold, on his arrival at Richmond, found large quantities of ſalt, rum, ſail-cloth, tobacco, and other merchandize, and that part of theſe commodities which was public property, he deſtroyed. The Britiſh troops afterwards diſperſed ſome ſmall parties of the Americans, took ſome ſtores, and a few pieces of cannon, and on the 20th of the ſame month, marched into Portſmouth. On the 25th, Capt. Barclay, with ſeveral ſhips of war, and a body of troops, under the command of Major Craig, arrived in Cape Fear river. The troops landed about nine miles from Wilmington, and on the 28th entered the town.—Gen. Greene having effected a junction, about the 10th of March, with a continental regiment, called *eighteen months men*, and two large bodies of militia, belonging to Virginia and North-Carolina, reſolved to attack the Britiſh troops under the command of Lord Cornwallis. The American army marched from the High Rock Ford on the 12th, and on the 14th arrived at Guilford. As the armies approached to each other, a few ſkirmiſhes enſued between ſome advanced parties, in which the king's troops had the advantage. On the morning of the 15th, Lord Cornwallis marched at day break, to meet the Americans, or to attack them in their encampment. About four miles from Guilford, the advanced guard of the Britiſh army, commanded by Lieut. Col. Tarleton, fell in with a corps of the Americans, conſiſting of Lieut. Col. Lee's legion, ſome Back Mountain men, and Virginia militia, with whom he had a ſevere ſkirmiſh, but whom he at length obliged to retire. The greater part of the country, in which the action happened, is a wilderneſs, with a few cleared fields interſperſed. The American army, which was poſted on a riſing ground, about a mile and a half from Guildford, was drawn up in three lines: the front was compoſed of the North-Carolinian militia; the ſecond line of Virginian militia; the third line conſiſting of two brigades, one of Virginia, and one of Maryland continental troops. About half an hour after one, P. M. the action commenced by a cannonade, which laſted about 20 minutes, when the Britiſh troops advanced in three columns, and attacked the North-Carolinian brigades, with great vigour, and ſoon obliged part of theſe troops, to quit the field: but the Virginia militia gave them a warm reception, and kept up a very heavy fire for a long time, till being beaten, the action became general almoſt every where. The exceſſive thickneſs of the woods rendered the Britiſh bayonets of little uſe, and enabled the broken corps of Americans to make frequent ſtands, with an irregular fire. The ſecond battalion of the guards firſt gained the clear ground near Guildford, and found a corps of continental infantry, formed in an open field on the left of the road. Deſirous of ſignalizing themſelves, they immediately attacked and ſoon defeated them, taking two 6 pounders; but as they purſued the Americans into the woods, with too much ardor, they were thrown into confuſion by a heavy fire, and inſtantly charged and driven back, by Lieut. Col. Waſhington's dragoons, with the loſs of the ſix pounders they had taken. But the American cavalry were afterwards repulſed, and the two 6 pounders again fell into the hands of the Britiſh troops. The ſpirited exertions of Brig. Gen. O'Hara, and of Lieut. Col. Tarleton greatly contributed to bring the action to a termination.—The Britiſh troops having at length broken the ſecond Maryland regiment, and turned the left flank of the Americans, got into the rear of the Virginian brigade, and appeared to be gaining their right, which would have encircled the whole of the continental troops, when Gen. Greene ordered a retreat. Many of the American militia diſperſed in the woods; but the continental troops retreated in good order to the Reedy Fork River, and croſſed at the ford about three miles from the field of action, and there halted. When they had collected their ſtragglers, they retreated to the iron works, 10 miles diſtant from Guildford, where they encamped. They loſt their artillery and two waggons laden with ammunition. It was a hard-fought action, and laſted an hour ane a half. Of the Britiſh troops, the loſs as ſtated by Lord Cornwallis, was 532 killed, wounded, and miſſing. Gen. Greene, in his account of the action tranſmitted to the Congreſs, ſtated the loſs of the continental troops to amount to 329 killed, wounded, and miſſing; but he made no eſtimate of the loſs of the militia. Of thoſe who were miſſing, few were made priſoners. Thay returned home, and never joined the camp, ſo that Greene's army ſuffered a greater diminution than the Britiſh. It was, however, ſoon apparent, that the advantages of the engagement were on his ſide: For though Lord Cornwallis iſſued out a proclamation ſetting forth his complete victory, yet on the 4th day after the battle he abandoned all his boaſted advantages, and proceeded to the neighbourhood of Wilmington, where he arrived on the 7th April. Soon after, General Greene endeavoured to make ſome vigorous attempts againſt the king's forces in South Carolina. Lord Rawdon had been appointed to defend the Poſt of Canada, with about 800 Britiſh and provincials; and on the 19th of April Gen. Greene appeared before that place with a large body of continentals and militia. He found it, however, impoſſible to attempt to ſtorm the town with any probability of ſucceſs; and therefore endeavoured to take ſuch a poſition as ſhould induce the Britiſh troops to ſally from their works. He poſted the Americans about a mile from the town, on an eminence covered with woods, and flanked on the left by an impaſſable ſwamp. But on the morning of the 25th, Lord Rawdon marched out of Camden, and attacked Gen. Greene in his camp. The Americans made a vigorous reſiſtance, but were at laſt compelled to give way; and the purſuit is ſaid to have been continued three miles. For ſometime after the action commenced, Gen. Gates entertained great hopes of defeating the Britiſh troops; in which he would probably have ſucceeded, had not ſome capital military errors been committed by one or two of the officers under him. On the American ſide Col. Waſhington had behaved extremely well in this action, having made upwards of 200 of the Engliſh priſoners, with 10 or 12 officers, before he perceived that the Americans were abandoning the field of battle. The loſs of the Engliſh was about 100 killed and wounded. Upwards of 100 of the Americans were taken priſoners; and, according to the account publiſhed by Gen. Greene, they had 126 killed and wounded. After this action, Greene retreated to Rugeley's mills, 12 miles from Camden, in order to collect his troops and wait for reinforcements. Notwithſtanding the advantage which Lord Rawdon had obtained over General Greene, he ſoon after found it neceſſary to quit that poſt; and the Americans made themſelves maſters of ſeveral other poſts which were occupied by the king's troops, the garriſons of which were obliged to ſurrender. Theſe troops were afterwards exchanged, under a cartel which took place between Lord Cornwallis and gen. Greene, for the releaſe of all priſoners of war in the ſouthern diſtrict. After theſe events, gen. Greene laid cloſe ſiege to Ninety-ſix, and on the 19th of June, he attempted to ſtorm the garriſon, but was repulſed with the loſs 75 killed and 150 wounded. Gen. Greene then retired with his army behind the Saluda, to a ſtrong ſituation, within 16 miles of Ninety-ſix. On the 18th April a large body of Britiſh troops, under the command of Gen. Philips and Gen. Arnold, embarked at Portſmouth in Virginia, on an expedition for deſtroying ſome of the American ſtores; in the courſe of which, they deſtroyed ſeveral armed ſhips, and ſmall veſſels, ſundry ware-houſes, upwards of 6000 hhds. of tobacco, a range of barracks, 800 barrels of flour, ſeveral mills, and a large range of rope walks and ſtore-houſes. But though conſiderable advantages were thus gained by the royal troops, yet no event took place from which it could rationally be expected that the termination of the war would be favourable to Great-Britain. It was alſo a diſadvantageous circumſtance, that there was a miſunderſtanding between Admiral Arbuthnot and Sir Henry Clinton, and a mutual diſapprobation of each other's conduct. This was manifeſt from their diſpatches to government, eſpecially from thoſe of Gen. Clinton, whoſe expreſſions reſpecting the conduct of the admiral were by no means equivocal. On the 16th March 1781, a partial action happened off the Capes of Virginia, between the fleet under Admiral Arbuthnot, conſiſting of ſeven ſhips of the line and one 50 gun ſhip, and a French ſquadron, conſiſting of the ſame number of ſhips of the line and one 40 gun ſhip. Some of the ſhips in both fleets received conſiderable damage in the action, and the loſs of the Engliſh was 30 killed, 73 wounded; but no ſhip was taken on either ſide, The britiſh fleet had, however, conſiderably the advantage; as the French were obliged to retire, and were ſuppoſed to be prevented by this action from carrying troops upon the Cheſapeak, in order to attack Gen. Arnold and impede the progreſs of Lord Corwallis. Lord Cornwallis, arrived at Wilmington, on the 7th of April, previous to which, he publiſhed a proclamation, calling upon all loyal ſubjects to take an active part in reſtoring good order and government, and promiſſing pardons to all rebels, &c. But it does not appear that any number of the Americans were allured by theſe promiſes to join the royal ſtandard. On the 20th May, his Lordſhip arrived at Peterſburgh in Virginia, where he joined a body of Britiſh troops, the command of which, by the death of Gen. Philips, had devolved on Brig. Gen. Arnold. Before this junction he had encountered conſiderable inconveniences, from the difficulty of procuring proviſions and forage; ſo that in a letter to Sir Henry Clinton, he informed him, that his cavalry wanted every thing, and his infantry every thing but ſhoes. He added, that he had experienced the diſtreſs of marching hundreds of miles in a country chiefly hoſtile, without one active or uſeful friend, without intelligence, and without communication with any part of the country. On the 6th July an action happened near the Green Springs in Viginia, between a reconnoitering party of the Americans, under Gen. Wayne, amounting to about 800, and a large party of the Britiſh army under Lord Cornwallis; in which the Americans had 127 killed and wounded, and the loſs of the royal troops is ſuppoſed to have been conſiderably greater. In this action no ſmall degree of military ſkill and courage was exhibited by the Americans. In a variety of ſkirmiſhes, the Marquis de la Fayette very much diſtinguiſhed himſelf, and diſplayed the utmouſt ardour in the American cauſe. In S. Carolina, an action happened on the 9th September near the Eataw Springs, between a large body of Britiſh troops under the command of Lieut. Col. Stuart, and a body of Americans under the command of Gen. Greene. It was an obſtinate engagement, and laſted near two hours; but the Americans were defeated, and two of their ſix pounders fell into the hands of the Britiſh. The loſs, however, of the royal troops was very conſiderable; amounting to more than 400 killed and wounded, and upwards of 200 miſſing. In the courſe of the ſame month, Gen. Arnold was ſent on an expedition againſt New-London, in Connecticut, where he deſtroyed a great part of the ſhipping, and an immenſe quantity of naval ſtores, European manufactures, and Eaſt and Weſt India commodities. The town itſelf was alſo burnt, owing to the exploſions of great quantities of gun-powder which happened to be in the ſtore houſes that were on fire. Fort Griſwold was taken but not without conſiderable loſs. It was defended by the Americans with great gallantry. The Britiſh troops entered with fixed bayonets, and were oppoſed with great vigour by the garriſon with long ſpears. After a moſt obſtinate defence of near 40 minutes, the aſſailants gained poſſeſſion of the fort, in which 85 Americans were killed, and 60 wounded, moſt of them mortally. Of the Britiſh troops Major Montgomery was killed by a ſpear in entering the American works; and 192 men were killed and wounded in the expedition.

America, United States of, history of the war with the, to its conclusion. Notwithſtanding the ſignal advantages that Lord Corwallis had obtained over the Americans, his ſituation in Virginia began by degrees to be very critical, as he did not receive thoſe reinforcements and ſupplies from Sir Henry Clinton, which he had expected, and which were neceſſary to the ſucceſs of his operations. Indeed, the commander in chief was prevented from ſending reinforcements to Lord Cornwallis, by his fears reſpecting New-York; againſt which he entertained great apprehenſions that Gen. Waſhington intended to make a formidable attack. In fact, that able general appears to have employed great fineſſe, to lead Sir Henry Clinton to entertain this imagination. Letters, expreſſive of this intention, fell into the hands of Sir Henry, which were manifeſtly written with a deſign that they ſhould be intercepted, and only with a view to deceive the Bririſh general. The project was ſucceſsful; and by a variety of judicious manœuvres, in which he completely out-generalled the Britiſh commander, he increaſed his apprehenſions about New-York, and prevented him from ſending aſſiſtance to Lord Cornwallis. Having for a conſiderable time kept Sir Henry Clinton in perpetual alarm in New-York, though with an army much inferior to the garriſon of that city, Gen. Waſhington ſuddenly quitted White Plains, croſſed the Delaware, and marched towards Viginia apparently with a deſign to attack Lord Cornwallis. Sir Henry then received information, that the Count de Graſſe, with a large French fleet, was expected every moment in the Cheſapeak, in order to co-operate with Gen. Waſhington. He immediately endeavoured to communicate this information to Lord Cornwallis; and alſo ſent him aſſurances, that he would either reinforce him, or make the beſt diverſion he could in his favour. In the mean time, Lord Cornwallis had taken poſſeſſion of the poſts of York-Town and Glouceſter, in Virginia, where he fortified himſelf in the beſt manner he was able. On the 28th Auguſt, Sir Samuel Hood, with a ſquadron from the Weſt-Indies, joined the ſquadron under the command of Admiral Graves before New-York. It was neceſſary, on account of the ſituation of Lord Cornwallis, that they ſhould immediately proceed to the Cheſapeak; but ſome time appears to have been needleſsly loſt. They arrived, however, in the Cheſapeak, on the 5th of September, with 19 ſhips of the line; where they found the Count de Graſſe, who had anchored in that bay on the 30th of Auguſt with 24 ſhips of the line. The French admiral had previouſly landed a large body of troops, which had been brought from Rhode-Iſland, and who immediately marched to join the American army under Gen. Waſhington. The Britiſh and French fleets came to an action on the ſame day in which the former arrived in the Cheſapeak. On board the Britiſh fleet 90 were killed and 246 wounded: ſome of the ſhips were greatly damaged in the engagement; and the Terrible, a 74 gun ſhip, was ſo much ſhattered, that it was afterwards found neceſſary to ſet fire to it. That this action had not been favourable to the Engliſh, was manifeſt from the event: the fleets continued in ſight of each other for 5 days ſucceſſively, and ſometimes were very near; but at length the French fleet all anchored within the Cape, ſo as to block up the paſſage. Admiral Graves then called a council of war, in which it was reſolved that the fleet ſhould proceed to New-York, that the ſhips might there be put into the beſt ſtate for the ſervice; and thus were the French left maſters of the navigation of the Cheſapeak. Before the news of this action had reached New-York, a council of war was held there, in which it was reſolved, that 5000 men ſhould be embarked on board the king's ſhips, to proceed to the aſſiſtance of Lord Cornwallis. But when it was known that the French were abſolute maſters of the Cheſapeak, it was thought inexpedient to ſend off that reinforcement immediately. In another council of war, it was reſolved, that, as Lord Cornwallis had proviſions to laſt him till the end of October, it was adviſeable to wait for more favourable accounts from Admiral Graves, or for the arrival of Admiral Digby, who was expected with three ſhips of the line. It was not then known at New-York, that Admiral Graves had determined to return with the whole fleet to that port. Mean time, the moſt effectual meaſures were adopted by Gen. Waſhington for ſurrounding the Britiſh army under Lord Cornwallis. A large body of French troops under the command of Lieut. Gen. the Count de Rochambeau, with a very conſiderable train of artillery, aſſiſted in the enterpriſe. The Americans amounted to near 8000 continentals and 5000 militia. Gen. Waſhington was inveſted with the authority of commander in chief of theſe combined forces. On the 29th of September, the iveſtment of York-Town was complete, and the Britiſh army quite blocked up. The day following, Sir Henry Clinton wrote a letter to Lord Cornwallis, containing aſſurances that he would do every thing in his power to relieve him, and ſome information concerning the ſteps that would be taken for that purpoſe. A duplicate of this letter was ſent to his Lordſhip, on the 3d of Oct. by Maj. Cochran, a very gallant officer, who went in a veſſel to the Capes, and made his way to Lord Cornwallis, through the whole French fleet, in an open boat. He got to York-Town on the 10th of the month; but ſoon after his arrival had his head carried off by a cannon ball. After the return of Admiral Graves, to New-York, a council of war was held, in which it was reſolved, that a large body of troops ſhould be embarked on board the ſhips as ſoon as they were refitted, and that the exertions of both fleet and army ſhould be made to form a junction with Lord Cornwallis. Sir Henry Clinton himſelf embarked on board the fleet, with upwards of 7000 troops, on the 18th; they arrived off Cape Charles, at the entrance of the Cheſapeak, on the 24th, where they received intelligence that Lord Cornwallis had, 5 days before, (viz. on the 19th of October,) ſurrendered himſelf and his whole army priſoners to the combined armies of America and France, under the command of Gen. Waſhington. By the articles of capitulation, the Britiſh troops were to be priſoners to the United States of America, and the ſeamen to the French King, to whoſe officers alſo the Britſh veſſels found at York-Town and Glouceſter were to be delivered up. The Britiſh priſoners amounted to more than 6000; but many of them, at the time of ſurrender, were incapable of duty. A conſiderable number of cannon, and a large quantity of military ſtores, fell into the hands of the Americans on this occaſion. —As no rational expectation now remained of a ſubjugation, the military operations that ſucceeded in America were of little conſequence. Some inconſiderable actions and ſkirmiſhes did indeed take place after that event; in which the refugees chiefly diſtinguiſhed themſelves, and diſcovered an inveterate animoſity againſt the Americans. On the fifth of May, 1782, Sir Guy Carleton arrived at New-York, being appointed to the command of the Britiſh troops in America in the room of Sir Henry Clinton. Two days after his arrival, he wrote a letter to General Waſhington, acquainting him, that Admiral Digby was joined with himſelf in a commiſſion to treat of peace with the people of America; tranſmitting to him, at the ſame time, ſome papers tending to manifeſt the pacific diſpoſition of the government and people of Britain towards thoſe of America. He alſo deſired a paſſport for Mr. Morgan, who was appointed to tranſmit a ſimilar letter of compliment to the congreſs. General Waſhington declined ſigning any paſſport till he had taken the opinion of congreſs upon that meaſure; and by them he was directed to refuſe any paſſport for ſuch a purpoſe. However, another letter was ſent to General Waſhington, dated the ſecond of Auguſt, ſigned by Sir Guy Carleton and rear-admiral Digby, in which they informed him that they were acquainted by authority that negociations for a general peace had already commenced at Paris; that Mr. Grenville was inveſted with full powers to treat with all the parties at war; and was then at Paris in the execution of his commiſſion. They farther informed him, that his majeſty, in order to remove all obſtacles to that peace which he had ſo ardently wiſhed to reſtore, had commanded his miniſters to direct Mr. Grenville, that the independency of the thirteen provinces ſhould be propoſed by him, in the firſt inſtance, inſtead of making it the condition of a general treaty. But ſome jealouſies were entertained by the Americans, that it was the deſign of the Britiſh court either to diſunite them, or to bring them to treat of a peace ſeparately from their ally the king of France: they therefore reſolved, that any man or body of men, who ſhould preſume to make any ſeparate or partial convention or agreement with the king of Great-Britain, or with any commiſſioner or commiſſioners under the crown of Great-Britain, ought to be conſidered and treated as open and avowed enemies to the United States of America; and alſo that thoſe ſtates could not with propriety hold any conference or treaty with any commiſſioners on the part of Great-Britain, unleſs they ſhould, as a preliminary thereto, either withdraw their fleets and armies, or elſe, in poſitive and expreſs terms, acknowledge the independence of the ſaid ſtates. They likewiſe reſolved, that any propoſition which might be made by the court of Great-Britain, in any manner tending to violate the treaty ſubſiſting between them and the king of France, ought to be treated with every mark of indignity and contempt. —In the month of June, the town of Savannah and the whole province of Georgia were evacuated by the king's troops; as was alſo Charleſton, South Carolina, about the cloſe of the year. In the mean time, the negociations for peace being continued, the proviſional articles were ſigned at Paris on the 30th of November by the commiſſioner of his Britannic Majeſty and the American commiſſioners, in which his majeſty acknowledged the united colonies of New-Hampſhire, Maſſachuſett's Bay, Rhode-Iſland, and Providence Plantations, Connecticut, New-York, New-Jerſey, Pennſylvania, Delaware, Maryland, Virginia North Carolina, South Carolina, and Georgia, to be 'free, ſovereign and independent ſtates." On the 4th of July, 1776, they declared themſelves to be free, ſovereign and independent; they had been acknowledged ſuch by the French king on the 31ſt of January, 1778, when he concluded with them a treaty of amity and commerce; Holland had acknowledged them as ſuch, April 19th, 1782; Sweden acknowledged them as ſuch, February 5th, 1783; Denmark the 25th of February; Spain in March, and Ruſſia in July, the ſame year. According to the report of the committee appointed for that purpoſe, the foreign debt of the United States, incurred by the war, amounted to $7,885,085. and the domeſtic debt to 34,115,290, total $42,000,375. But the coſt to Britain was computed at the enormous ſum of $513,707,818. As to the loſs of men during the war, the United States is ſuppoſed to have loſt by the ſword not leſs than 70,000. Vaſt numbers died on board the priſon ſhips at New-York, and in one only, the Jerſey, not leſs than 11,000. Many periſhed in conſequence of their being ſo crowded together, others through cruel uſage, and ſeveral for want of thoſe exertions, which would have promoted health. But whatever the Americans may object againſt the Britiſh, on account of the loſs of lives and property which they ſuſtained, they had certainly abundant cauſe for thankfulneſs to the God of armies for having conducted them through the conteſt into a ſtate of independence, with ſufferings ſo light and ſhort, when comparatively conſidered. It was not quite eight years that they were engaged in it, computing from the firſt commencement of hoſtilities to the ratifying of the proviſional treaty; and this was a leſs time, than that in which the ſtates of Holland, in their glorious ſtruggle with Spain, even dared to avow their claim for independence. Upon the whole, there is not perhaps a ſingle inſtance in hiſtory of ſo great a revolution being effected in ſo ſhort a time, and with ſo little loſs of lives and property. We ſhall conclude this article by obſerving, that the immortal Waſhington, the generaliſſimo of the American army, after having thus by acts of the greateſt wiſdom and fortitude, vanquiſhed the enemies of his country, and procured for it the bleſſings of liberty and independence, proceeded to Annapolis, where, on the 23d of Dec. 1783, he delivered his commiſſion to the preſident of Congreſs, and then retired to private life. A ſhort time previous to this, he had delivered in his accounts to the proper officer, down to Dec. 13th, all in his own hand writing, and every entry made in the moſt particular manner, ſtating the occaſion of each charge, ſo as to give the leaſt trouble in examining and comparing them with the vouchers with which they were attended. The whole amount of his expenditures from the time he received his commiſſion in 1775, to his reſignation in 1783, amonnted only to $64,290. and 92 cents. Happy would it have been for Great-Britain, perhaps, too we may add, for the United States, had each individual who handled public money, during that period, been equally conſcientious and punctual. Having now brought down the hiſtory of our country to that period when our independence was recognized by the moſt powerful nations of Europe, we conceive it will be moſt proper to poſtpone the ſequel till we come to the article **United States**. By the time we ſhall arrive at that part of our work, various meaſures, which have of late been adopted by the preſent adminiſtration, and which are now the ſubject of much ſpeculation, will clearly evince, whether they have been founded on ſound or erroneous principles, by their being tried by that beſt of all criterions, the teſt of experience; and it will certainly be much more intereſting to our readers to be made acquainted with the final reſult of thoſe meaſures than to peruſe the moſt plauſible conjectures, which it is poſſible, at this time, to advance upon the ſubject. Under the head **United States**, the hiſtory will likewiſe be continued till the period at which that article ſhall be put to preſs: and to this we muſt alſo refer our readers for the account of their extent, boundaries, lakes, mountains, rivers, population, inhabitants, character, government, revenue, &c. &c.

With reſpect to the Britiſh ſettlements in North America, an account of them will be found under the articles **Britain New**, **Canada**, **Newfoundland**, **Nova Scotia**, &c. and the North American dominions which belong to Spain, under the heads **California**, **Florida**, **E. and W. Mexico Old**, and **Louisiana**; which laſt, however, agreeably to the accounts we have lately received, (April 1802) is very probably, by this time, transferred to the French. Having now given as particular an account of North America, as the nature of this undertaking will admit of, we ſhall now proceed to take ſome general notice of the ſouthern part of this extenſive continent.

America, South, boundaries, extent, climate, produce, &c. of. South America is a peninſula, ſurrounded on all ſides by the ocean, except at the iſthmus of Darien, by which it is joined to North-America. It is bounded on the W. by the Pacific Ocean, on the N. by the iſthmus and the Atlantic, on the E. by the Ethiopic, and on the S. by that boundleſs Ocean, which conſiſts of the mingled waves of the Pacific, the Ethiopic, and the Antarctic Icy Oceans. It extends S. and N. from between the 54th and 55th degree S. lat. to the 12th N lat. and E. and W. between 40 E. and 5 W. Lon. from Philadelphia, comprehending, though not the largeſt, by far the richeſt diviſion of the American continent. Having been firſt diſcovered by Columbus, it was claimed, and barbarouſly conquered by the Spaniards, who ſtill poſſeſs the greater part of it, viz. Terra Firma, New-Caſtile, Peru, part of Chili, and Paraguay. The Portugueſe poſſeſs Braſil; the French, Cayenne; and the Dutch, Surinam. The reſt of it, conſiſting of part of Chili, and the countries known by the name of Amazonia and Patagonia, is ſtill inhabited by the original natives. The unparallelled barbarities committed by the Spaniards in this part of the New World, as well as in Mexico, while they afford the Theologiſt a melancholy proof of the truth of that ſcriptural maxim, that "the heart of man is *deſperately wicked*," would almoſt lead the humane philoſopher to wiſh that America had never been diſcovered, rather than that an extenſive country, productive of every neceſſary and convenience to enable millions of mankind to live in eaſe and affluence, ſhould have been drenched with the blood of theſe millions, and doomed to be the ſcene of their tortures. See **Mexico**, **Peru**, &c. Nor can any reader of ordinary ſenſibility help regretting, that, though theſe ſhocking ſcenes are paſt, the rod of Spaniſh deſpotiſm ſtill hangs heavy over its preſent inhabitants, and equally prevents their happineſs and the increaſe of their population. He will conſole himſelf, however, with the hopes, that the period of their emancipation is not far diſtant, and that the attempts which have of late been made, by the deſcendants of the original inhabitants, to throw off the yoke of their European oppreſſors, will at laſt prove ſucceſsful. The climate of South America, though the greater part of it lies in the torrid zone, is not ſo intolerably hot, as that of thoſe countries that lie in the ſame degree of latitude in the other quarters of the globe. Some parts of Peru, which is entirely within the tropics, are even diſagreeably cold, owing to the air blowing from the South Sea on the one ſide, and the ſnow-covered tops of the Andes on the other; and the climate of Chili, which is within the temperate zone, is one of the moſt delightfully moderate in the world. In other parts it varies greatly, the air in ſome being ſultry, in others cool; though it is generally warmeſt towards the north; ſome places again being *frequently* flooded, while others are quite dry. But in thoſe places where it never rains, the ſoil, which in general is very fertile, is ſufficiently watered by dew to render it productive. From May to November (the ſeaſon called *winter* by the natives) there is in ſome places, particularly in New-Caſtile, a continued ſucceſſion of thunder, rain, and tempeſts; the rains falling with ſuch impetuoſity as to give the plains the appearance of an ocean. But although in dry weather, the perpetual verdure of the woods, the luxuriance of the plains, and the rich fruits of all kinds which it produces, counterbalance the winter ſtorms; the tremendous earthquakes it is occaſionally ſubject to, more than outweigh even the precious metals of its mines, which are, beyond controverſy, the richeſt in the known world. Vaſt quantities of gold are waſhed down from the mountains, by the rivers; and the annual amount of this article in Chili alone is no leſs than 800,000 dollars. As a ſpecimen of the immenſe riches of the mines of South America, we ſhall only mention farther here, that the ſilver mines of Potoſi alone, which were diſcovered accidentally by an Indian, in 1545, produced, for a period of 93 years thereafter, about 4,255,000 Spaniſh dollars annually, amounting, during the whole of that period, to the immenſe ſum of 395,619,000 dollars! What then may the total produce of all their other gold and ſilver mines have amounted to, ſince their firſt bloody conqueſt of the country? In 1682, when the Duke de la Palada, the viceroy, made his public entry into Lima, the inhabitants cauſed the ſtreets to be paved with ingots of ſilver, to the amount of 75,480.000 Dollars. Beſides theſe mines, there are mines of copper, tin, lead, mercury, and of that ſingular new metal called platina, which ſome metallurgiſts reckon ſuperior in ſeveral reſpects to gold itſelf. See **Platina**. Pearls are alſo plentifully produced upon the coaſts, and the negroes are very expert in diving for them, though they are ſometimes ſnapt up by the ſharks, which are frequent on the coaſts. It is hardly neceſſary to mention, that vegetables of every kind thrive well, in a country where both heat and moiſture abound. The principal mountains in South America are the Cordeleras, and that great range called the Andes, whoſe cloud-capt ſummits, covered with eternal ſnow, defy the optic powers of the inhabitants below. See **Andes.** Among the mountains of South America there are alſo ſome volcanos, which rage with internal fires, while their tops are covered with ſnow. The rivers Amazon, La Plata, and Oronoko, are of an aſtoniſhing length and breadth, not to mention the Charge, the Darien, the Gradne, the Eſſequibo, the Janeiro, and many others, which are equal to the largeſt rivers in Europe.

AMERICA, S. POPULATION, GOVERNMENT, AND TRADE OF. The inhabitants of South America conſiſt of Aboriginal natives, Europeans, Creoles, and negro ſlaves. As it is impoſſible to form any conjectures reſpecting the former claſs, which includes the Amazonians and Patagonians, nations of whom we as yet know very little, we can only make a random eſtimate of the three laſt claſſes, including ſuch of the original natives as are ſubjected to, or reſide among them; which, from the beſt of our information, does not exceed 500,000. Such are the direful effects of tyranny and oppreſſion, that one of the fineſt countries in the world, which formerly maintained ſeveral millions of people in affluence and happineſs, now hardly reaches half a million, including both the oppreſſors and the oppreſſed. Nor need we wonder much at this immenſe depopulation, under the wretched ſyſtem of policy adopted by the Spaniards, when we find, that among their other oppreſſive laws, there is one that prohibits marriages, under the ſevereſt penalties, between the native Indians and the negroes; leſt theſe two claſſes, being united by the ties of nature, ſhould alſo unite their numbers and ſtrength, and thus become able conjunctly to break thoſe oppreſſive chains, of which ſeparately they cannot divide a ſingle link. Of a piece with ſuch tyrannical laws is their whole ſyſtem of legiſlation in the Spaniſh provinces, where the viceroys are abſolute, and the petty deſpots under them proportionably ſo in their ſpheres. The governments of the Dutch and Portugueſe provinces are little better. The trade and manufactures of South America are confined chiefly to the cities, in ſome of which, particularly Lima, they are carried on to a great extent. Wines, oils, cottons, pimento, maize, caſſava, ſugars, dried fruits, grain of all kinds, honey, wax, gold, ſilver, copper, tin, lead, hides, hemp, ſalted meat, tobacco, horſes, mules, pearls, diamonds, and medicines of various kinds, particularly the Peruvian bark, are among the chief articles of export from the different provinces in South America. For farther particulars, ſee **Brasil, Cayenne, Chili, Peru,** &c.

AMERICAN Animals, Birds, Reptiles, &c.—America contains, at leaſt one half of the quadrupeds of the known world, the various kinds of which, according to Buffon, do not exceed 300. It is ſuppoſed that the whole of the American quadrupeds are not yet diſcovered, but of thoſe that are known, 74 ſpecies are peculiar to America. Among theſe, the moſt remarkable are, the catamount, cougar, kinkajou, lama, (or Peruvian ſheep) manati, (a link between the quadrupeds and the fiſhes) margay, mink, mooſe-deer, morſe, (or ſea cow) opoſſum, pecan, raccoon, ſapajou, ſkunk, ſloth, tapir, vicunna, &c. &c. Of the Mammoth, which is now ſuppoſed to be extinct, but whoſe huge bones have been dug up in various parts of America, particularly in the United States, the moſt incredible ſtories are told by the natives. That it muſt, however have been an animal infinitely larger than any which is at preſent to be ſeen in the known parts of the world is true beyond contradiction, as the celebrated Mr. Peale of Philadelphia, a gentleman, who has been at more trouble than any other perſon, in collecting the natural curioſities of America, has fixed at immenſe pains and expences the bones of this wonderful animal together, ſo as to form a complete ſkeleton and thus afford occular demonſtration, to ſuch as were formerly diſpoſed to doubt of its enormous bulk. As we ſhall give a particular account of this wonderful creature, under the article **Mammoth,** we ſhall only obſerve, that thoſe who have ſeen the ſkeleton, will not be diſpoſed to doubt the correctneſs of Mr. Jefferſon's aſſertion in his notes on Virginia, that "its teeth are five or ſix times as large as thoſe of the Elephant." In South America there are, likewiſe, the Toporiaſſou, a ſpecies between a bull and an aſs, but without horns, and quite harmleſs, and the Janovreras, a fierce animal, and ſomewhat like a greyhound: for a particular account of all which ſee under their reſpective heads. The birds in general much excel thoſe of Europe in the beauty of their plumage, but are ſaid to be inferior in the melody of their notes. No complete catalogue has yet been made of them. Vultures, eagles, owls, hawks, kites, woodpeckers, cranes, herons, cuckows, pelicans, teals, plovers, &c. abound in great variety of ſpecies; beſides a vaſt number of others, for which we have no names. In Mexico, alone there are 200 ſpecies peculiar to it. The condor, a bird peculiar to Peru, is prodigiouſly large and voracious. Swans of a very large ſize abound in the lakes. Some of them weigh 36 lb. and meaſure ſix feet in length. The wakon, the *awakener*, a bird which alarms all the birds near it upon any appearance of danger, the flamingo, (the ſmalleſt of the feathered tribe) and a great number of other curious birds, are peculiar to America. Of reptiles and ſerpents there is a vaſt variety, ſuch as lizards, crocodiles, tortoiſes, ſnakes, vipers, adders, toads, &c. Some of the ſnakes meaſure from 25 to 50 feet in length. Inſects of all kinds are numberleſs: beetles, flies, ſpiders, worms, muſketoes, bugs, crickets, waſps, hornets, bees, ants, locuſts, &c. &c. The tarantula is alſo common. But of all the inſect tribe, the *wheat-fly*, or as it is commonly called, the *Heſſian-fly*, has of late been the moſt deſtructive.—Clouds of theſe occaſionally light upon growing wheat, and by depoſiting their eggs in the young plant, deſtroy whole acres of it. Fiſhes of all ſizes, from the whale to the minnow, frequent the American coaſts; as well as that wonderful animal the torporific eel, which, upon being touched, either with the hand or with an iron rod, gives a ſhock like electricity.

AMERICANS. As the people of the United States and the ſeveral colonies, which have been ſettled in America by the different nations of Europe will be found deſcribed under their reſpective heads, we mean in the following ſections only to treat of the Aboriginal inhabitants, or as they are commonly ſtiled **American Indians.**

AMERICANS, ASPECT, COLOUR, CHARACTER, CUSTOMS, DRESS, &c. OF THE. The following account of the native American is given by Don Antonio Ulloa, in a work intitled *Memoires Philoſophiques, &c. de l'Amerique.* "The American Indians are naturally bordering upon red.

Their frequent expoſure to the ſun and wind changes it to their ordinary duſky hue. The temperature of the air appears to have little or no influence in this reſpect. There is no perceptible difference in complexion between the inhabitants of the high and thoſe of the low parts of Peru; yet the climates are of an extreme difference. Nay, the Indians who live as far as 40 degrees and upwards S. or N. of the equator, are not to be diſtinguiſhed, in point of colour, from thoſe immediately under it. There is alſo a general conformation of features and perſon, which, more or leſs, characterizeth them all. Their chief diſtinctions in theſe reſpects are a ſmall fore-head, partly covered with hair to the eye-brows, little eyes, the noſe thin, pointed, and bent towards the upper lip; a broad face, large ears, black, thick, and lank hair; the legs well formed, the feet ſmall, the body thick and muſcular; little or no beard on the face, and that little never extending beyond a ſmall part of the chin and upper lip. It may eaſily be ſuppoſed that this general deſcription cannot apply, in all its parts, to every individual; but all of them partake ſo much of it, that they may be eaſily diſtinguiſhed even from the mulattoes, who come neareſt to them in point of colour. The reſemblance among all the American tribes is not leſs remarkable in reſpect to their genius, character, manners, and particular cuſtoms. The moſt diſtant tribes are, in theſe reſpects, as though they formed but one nation.—The character of the North American Indians is altogether founded upon their circumſtances and way of life. A people who are conſtantly employed in procuring the means of a precarious ſubſiſtence, who live by hunting the wild animals, and who are generally engaged in war with their neighbours, cannot be ſuppoſed to enjoy much gaiety of temper, or a high flow of ſpirits. The Indians, therefore, are in general grave, even to ſadneſs; they have nothing of that giddy vivacity peculiar to ſome nations of Europe, and they deſpiſe it. Their behaviour to thoſe about them is regular, modeſt, and reſpectful. Ignorant of the arts of amuſement, of which that of ſaying trifles agreeably is one of the moſt conſiderable, they never ſpeak, but when they have ſomething important to obſerve; and all their actions, words, and even looks, are attended with ſome meaning. This is extremely natural to men who are almoſt continually engaged in purſuits, which to them are of the higheſt importance.—Their ſubſiſtence depends entirely on what they procure with their hands; and their lives, their honour, and every thing dear to them, may be loſt by inattention to the deſigns of their enemies. As they have no particular object to attach them to one place more than another, they fly wherever they expect to find the neceſſaries of life in greateſt abundance. Cities, which are the effects of agriculture and arts, they have none. The different tribes or nations are for the ſame reaſon extremely ſmall, when compared with civilized ſocieties, in which induſtry, arts, agriculture and commerce, have united a great number of individuals, whom a complicated luxury renders uſeful one to another. Theſe ſmall tribes live at a vaſt diſtance; they are ſeparated by a deſert frontier, and hid in the boſom of impenetrable and almoſt boundleſs foreſts. Of their virtues, we ſhall have occaſion to ſpeak hereafter, but with regard to the worſt parts of the American character, cruelty and revenge, it may be fairly queſtioned, whether the inſtances of theſe, either in reſpect
to their cauſe or their atrocity, be at all com
exhibited in European hiſtory—To thoſe,
the Spaniards, at the firſt diſcovery of Ame
indicated by the engines found on board th
mada; to thoſe which, in cold blood, were
the Dutch at Amboyna; to the maſſacres, whi
the ſoil of France, or to the ſhocking ba
have been perpetrated by the Engliſh agai
and unoffending natives of the Eaſt. That "
rous and cowardly" is a character with whic
no reaſon to charge them: On the contrary
brave, when an enterpriſe depends on brav
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tion of an enemy by ſtratagem, and in the
his own perſon free from injury: or perhap
while it is education which teaches us to hon
than fineſſe. He will defend himſelf againſ
mies, always chooſing to be killed rather th
even to the whites, who he knows will treat
other ſituations, alſo, he meets death with mo
and endures torture with a firmneſs unknown
zed people. Much leſs are they to be ch
people of no vivacity, and who are excited t
tion only by the calls of hunger and thirſt.
which they ſo much delight, and which to o
be the moſt ſevere exerciſe, fully contradi
mention their fatiguing marches, and the toi
ily and cheerfully undergo in their military
It is true, that when at home they do not
ſelves in labour or the culture of the ſoil: b
the effect of cuſtoms and manners which hav
to the province of the women. But it is
averſe to ſociety and a ſocial life." Can an
inapplicable than this to a people who alway
or in clans? Or can they be ſaid to have
who conduct all their affairs in national
pride themſelves in their national characte
der an inſult or injury done to an individ
ger as done to the whole, and reſent it
All the Indian nations have a peculiar pleaſ
their bodies of a red colour, with a certain
It may indeed ſeem ſingular that theſe nati
tural colour is red, ſhould affect the ſame c
tificial ornament. But it may be obſerve
nothing in this reſpect but what correſponds
of Europeans, who alſo ſtudy to heighten an
vantage the natural red and white of thei
The northern nations of America; beſides
which is predominant, employed alſo blac
and green, in painting their bodies. The
theſe colours is a matter of as great conſide
Indians of Louiſiana and the vaſt regions e
north, as the ornaments of dreſs among th
nations. No lady of the greateſt faſhion eve
mirror with more anxiety, than the Indians
ing their bodies. Five or ſix hours are fr
ſary for the completion of this buſineſs; for
firſt attempts do not always ſucceed to thei
efface them, and begin a-new upon a better
quette is more faſtidious in her choice of o
more vain when the important adjuſtment is

delight and ſelf-ſatisfaction are then ſo great, that the mirror is hardly ever laid down. An Indian painted to his mind is the vaineſt of all the human ſpecies. Such of them as have made themſelves eminent for bravery, or other qualifications, are diſtinguiſhed by figures painted on their bodies. They introduce the colours by making punctures on their ſkin, and the extent of ſurface which this ornament covers, is proportioned to the exploits they have performed. Some paint only their arms, others both their arms and legs; others again their thighs, while thoſe who have attained the ſummit of warklike renown, have their bodies waſhed from the waiſt upwards. This is the heraldry of the Indians; the devices of which are probably more exactly adjuſted to the merits of the perſons who bear them, than thoſe of more civilized countries. Beſides the ornaments, the warriors alſo carry plumes of feathers on their heads, their arms and ancles. Theſe likewiſe are tokens of valour, and none but ſuch as have been thus diſtinguiſhed may wear them. The propenſity to indolence is equal among all the tribes of Indians. The only employment of thoſe who have preſerved their independence is hunting and fiſhing. In ſome diſtricts the women practice agriculture, in raiſing Indian corn and pompions, of which they form a ſpecies of aliment by bruiſing them together: They alſo prepare the ordinary beverage in uſe among them, taking care at the ſame time, of the children, of whom the fathers take no care. Among the North-Americans, it is diſgraceful to be hairy on the body. They ſay it likens them to hogs. They therefore pluck the hair as faſt as it appears. Every nation has its cuſtoms. "I have ſeen an Indian beau with a looking-glaſs in his hand, (ſays Mr. Jefferſon) examining his face for hours together, and plucking out by the roots every hair he could diſcover, with a kind of tweezer made of a piece of fine braſs wire, that had been twiſted round a ſtick, and which he uſed with great dexterity." The Indians of South-America diſtinguiſh themſelves by modern dreſſes, in which they affect various taſtes. Thoſe of the high country, and of the vallies in Peru, dreſs partly in the Spaniſh faſhion. Inſtead of hats they wear bonnets of coarſe double cloth, the weight of which neither ſeems to incommode them when they go to warmer climates, nor does the accidental want of them ſeem to be felt in ſituations where the moſt piercing cold reigns. Their legs and feet are always bare, if we except a ſort of ſandals made of the ſkins of oxen.

AMERICANS, FORM AND STATURE OF THE. Of the ſhape and character of the Mexican Indians, the Abbe Clavigero gives a moſt advantageous deſcription; which he aſſerts no one in America will contradict, unleſs he views them with the eye of a prejudiced mind. It is true, that Ulloa ſays, in ſpeaking of the inhabitants of Quito, he had obſerved, "that imperfect people abounded among them; that they were either irregularly diminutive, or monſtrous in ſome other reſpect; that they become either inſenſible, dumb or blind; or wanted ſome limb of their body." Having therefore made ſome inquiry reſpecting this ſingularity of the Quitans, the Abbe found, that ſuch defects were neither cauſed by bad humours, nor by the climate, but by the miſtaken and blind humanity of their parents, who, in order to free their children from the hardſhips and toils to which the healthy Indians are ſubjected by the Spaniards, fix ſome deformity or weakneſs upon them that they may become uſeleſs: A circumſtance of miſery which does not happen in other countries of America, nor in thoſe places of the ſame kingdom of Quito, where the Indians are under no ſuch oppreſſion. M. de Paw, and, in agreement with him, Dr. Robertſon, ſays, that no deformed perſons are to be found among the ſavages of America; becauſe, like the ancient Lacedemonians, they put to death thoſe children which are born hunch-backed, blind, or defective in any limb; but that in thoſe countries where they are formed into ſocieties, and the vigilance of their rulers prevent the murder of ſuch infants, the number of their deformed individuals is greater than it is in any other country of Europe. This would make an exceeding good ſolution of the difficulty if it were true: But if, poſſibly, their has been in America a tribe of ſavages who have imitated the barbarous example of the celebrated Lacedemonians, it is certain that thoſe authors have no grounds to impute ſuch inhumanity to the reſt of the Americans; for that it has not been the practice, at leaſt with the far greater part of thoſe nations, is to be demonſtrated from the atteſtations of the authors the beſt acquainted with their cuſtoms. Concerning the ſtature of the Americans, M. de Paw ſays, in general, that although it is not equal to the ſtature of the Caſtilians, there is but little difference between them. But the Abbe Clavigero evinces, that the Indians who inhabit thoſe countries lying between 9. and 40. of N. Lat. which are the limits of the diſcoveries of the Spaniards, are more than five Pariſian feet in height, and that thoſe who do not reach that ſtature are as few in number amongſt the Indians as they are amongſt the Spaniards. It is beſides certain, that many of thoſe nations, as the *Apaches*, the *Hiaqueſe*, the *Pimeſe*, and *Cochimies*, are at leaſt as tall as the talleſt Europeans: and that, in all the vaſt extent of the new world, no race of people has been found, except the Eſquimaux, ſo diminutive in ſtature as the Laplanders, the Samojeds, and Tartars, in the north of the old continent. In this reſpect, therefore, the inhabitants of the two continents are upon an equality.

AMERICANS, FRIENDSHIP OF THE. Their friendſhips are ſtrong, and faithful to the uttermoſt extremity. A remarkable inſtance of this appeared in the caſe of the late Col. Byrd, who was ſent to the Cherokee nation to tranſact ſome buſineſs with them. It happened that ſome of our diſorderly people had juſt killed one or two of that nation. It was therefore propoſed in the council of the Cherokees that Col. Byrd ſhould be put to death in revenge for the loſs of their countrymen. Among them was a chief called *Silouee*, who, on ſome former occaſion, had contracted an acquaintance and friendſhip with Col. Byrd. He came to him every night in his tent, and told him not to be afraid, they ſhould not kill him. After many days deliberation, however, the determination was, contrary to Silouee's expectation, that Col. Byrd ſhould be put to death, and ſome warriors were diſpatched as executioners. Silouee attended them; and when they entered the tent, he threw himſelf between them and Byrd, and ſaid to the warriors, "This man is my friend; before you get at him you muſt kill me." On which they returned; and the council reſpected the principle ſo much as to recede from their determination.

AMERICANS, FRIGIDITY AND STERILITY OF THE. The Count de Buffon and M. de Paw alledge that the American Indians "have no ardour for their female."—It is true, that they do not indulge thoſe exceſſes, nor diſcover that fondneſs, which are cuſtomary in Europe; but this is not owing to a defect in nature, but to manners. Their ſoul is wholly bent upon war. This is what procures them glory among the men, and makes them the admiration of the women. To this they are educated from their earlieſt youth. When they purſue game with ardour, when they bear the fatigues of the chace, when they ſuſtain and ſuffer patiently hunger and cold; it is not ſo much for the ſake of the game they purſue, as to convince their parents and the council of the nation, that they are fit to be enrolled in the number of the warriors. If a young man were to diſcover a fondneſs for women before he has been to war, he would become the contempt of the men, and the ſcorn and ridicule of the women: Or were he to indulge himſelf with a captive taken in war, and much more were he to offer violence in order to gratify his luſt, he would incur indelible diſgrace. The ſeeming frigidity of the men, therefore, is the effect of manners, and not a defect of nature. They are neither more defective in ardour, nor more impotent with the female, than are the whites reduced to the ſame diet and exerciſe. —"They raiſe few children."—They indeed raiſe fewer children than we do; the cauſes of which are to be found, not in difference of nature, but of circumſtance. The women very frequently attending the men in the parties of war and hunting, child-bearing becomes extremely inconvenient to them. It is ſaid, therefore, that they have learned the practice of procuring abortion by the uſe of ſome vegetable; and that it even extends to prevent conception for conſiderable time after. During theſe parties they are expoſed to numerous hazards, to exceſſive exertions, to the greateſt extremities of hunger. Even at their homes, the nation depends for food, through a certain part of every year, on the gleanings of the foreſt; that is, they experience a famine once every year. With all animals, if the female be badly fed, or not fed at all, her young periſh; and if both male and female be reduced to like want, generation becomes leſs active, leſs productive. To the obſtacles, then, of want and hazard, which nature has oppoſed to the multiplication of wild animals, for the purpoſe of reſtraining their numbers within certain bounds, thoſe of lobour and of voluntary abortion are added with the Indian. No wonder, then, if they multiply leſs than we do. Where food is regularly ſupplied, a ſingle farm will ſhew more of cattle than a whole country of foreſts can of buffaloes. The ſame Indian women, when married to white traders, who feed them and their children plentifully and regularly, who exempt them from exceſſive drudgery, who keep them ſtationary and unexpoſed to accident, produce and raiſe as many children as the white women. Inſtances are known, under theſe circumſtances, of their raiſing a dozen children. Neither do they ſeem to be deficient in natural affection. On the contrary, their ſenſibility is keen; even the warriors weeping moſt bitterly on the loſs of their children; though in general they endeavour to appear ſuperior to human events.

AMERICANS, FUNERAL RITES AMONG THE. The force of their friendſhip principally appears by the treatment of their dead. When any one of the ſociety is cut off, he is lamented by the whole: On this occaſion a thouſand ceremonies are practiſed, denoting the moſt lively ſorrow. No buſineſs is tranſacted, however preſſing, till all the pious ceremonies due to the dead are performed. The body is waſhed, anointed and painted. Then the women lament the loſs with hideous howlings, intermixed with ſongs which celebrate the great actions of the deceaſed and his anceſtors. The men mourn in leſs extravagant manner. The whole village is preſent at the interment, and the corpſe is habited in their moſt ſumptuous ornaments. Cloſe to the body of the defunct are placed his bows and arrows, with whatever he valued moſt in his life, and a quantity of proviſion for his ſubſiſtence on the journey which he is ſuppoſed to take. This ſolemnity, like every other, is attended with feaſting. The funeral being ended, the relations of the deceaſed confine themſelves to their huts for a conſiderable time to indulge their grief. After an interval of ſome weeks they viſit the grave, repeat their ſorrow, new clothe the remains of the body, and act over again all the ſolemnities of the funeral. Among the various tokens of their regard for their deceaſed friends, the moſt remarkable is what they call the *feaſt of the dead*, or the *feaſt of ſouls*. The day for this ceremony is appointed in the council of their chiefs, who give orders for every thing which may enable them to celebrate it with pomp and magnificence; and the neighbouring nations are invited to partake of the entertainment. At this time, all who have died ſince the preceding feaſt of the kind are taken out of their graves. Even thoſe who have been interred at the greateſt diſtance from the villages are diligently ſought for, and conducted to the rendezvous of the dead, which exhibits a ſcene of horror beyond the power of deſcription. When the feaſt is concluded, the bodies are dreſſed in the fineſt ſkins which can be procured, and after being expoſed ſome time in this pomp, are again committed to the earth with great ſolemnity, which is ſucceeded by funeral games.

AMERICANS, GOVERNMENT OF THE. There is eſtabliſhed in each ſociety, a certain ſpecies of government, which over the whole continent of America, prevails with little variation. Without arts, riches, or luxury, the great inſtruments of ſubjection in poliſhed ſocieties, an American has no method, by which he can render himſelf conſiderable among his companions, but by ſuperiority in perſonal qualities of body or mind. But as nature is not laviſh in her perſonal diſtinctions, where all enjoy the ſame education, all are pretty much equal, and deſire to remain ſo. Liberty, therefore, is the prevailing paſſion of the Americans; and their government, under the influence of this ſentiment, is better ſecured, than by the wiſeſt political regulations. They are very far, however, from deſpiſing all ſort of authority; they are attentive to the voice of wiſdom, which experience has conferred on the aged, and they enliſt under the banners of the chief, in whoſe valour and military addreſs they have learned to repoſe their confidence. In every ſociety, therefore, there is to be conſidered the power of the chief and of the elders; and according as the government inclines more to the one or to the other, it may be regarded as monarchical, or as a ſpecies of ariſtocracy. Among thoſe tribes, which are moſt engaged in a war, the power of the chief is naturally predominant; becauſe the idea of having a military leader, was the firſt ſource of his ſuperiority, and the continual exigencies of the ſtate requiring ſuch a leader, will continue to ſupport, and even to enhance it. His power, however, is rather perſuaſive than coercive; he is reverenced as a *father*, rather than feared as a *monarch*. He has no guards, no priſons, no officers of juſtice, and one act of ill-judged violence would pull him from his dignity. The elders, in the other form of government, which may be conſidered as an ariſtocracy, have no more power. In ſome tribes, indeed, there are a kind of hereditary nobility, whoſe influence being conſtantly augmented by time, is more conſiderable. But this ſource of power, which depends chiefly on the imagination, by which we annex to the merit of our contemporaries, that of their forefathers, is too refined to be very common among the natives of America. In moſt countries, therefore, age alone is ſufficient for acquiring reſpect, influence, and authority. It is age which teaches experience, and experience is the only ſource of knowledge among a barbarous people. Among thoſe perſons, buſineſs is conducted with the utmoſt ſimplicity, and which may recal to thoſe who are acquainted with antiquity, a picture of the moſt early ages. The heads of families meet together, in a houſe or cabin, appointed for the purpoſe. Here the buſineſs is diſcuſſed; and here thoſe of the nation diſtinguiſhed for their eloquence or wiſdom, have an opportunity of diſplaying thoſe talents. Their orators, like thoſe of Homer, expreſs themſelves in a bold figurative ſtyle, more ſtrong than refined nations can well bear, and with geſtures equally violent, but often extremely natural and expreſſive. When the buſineſs is over, and they happen to be provided with food, they appoint a feaſt upon the occaſion, of which almoſt the whole nation partakes. The feaſt is accompanied with a ſong in which, the real or fabulous exploits of their forefathers are celebrated. They have dances, too, chiefly of the military kind; and their muſic and dancing accompany every feaſt. To aſſiſt their memory, they have belts of ſmall ſhells, or beads, of different colours, each repreſenting a particular object, which is marked by their colour and arrangement. At the concluſion of every ſubject on which they diſcourſe, when they treat with a foreign ſtate, they deliver one of thoſe belts; for if this ceremony ſhould be omitted, all that they have ſaid paſſes for nothing. Theſe belts are carefully depoſited in each town, as the public records of the nation; and to them they occaſionally have recourſe, when any public conteſt happens with a neighbouring tribe. Of late, as the materials of which thoſe belts are made, have become ſcarce, they often give ſome ſkin in place of the *wampum* (the name of the beads,) and receive in return, preſents of more value, for they never conſider a treaty is binding, unleſs every article in it be ratified by ſuch a gratification. Such, in general, is the government of the American Indians, but every tribe has ſomething peculiar to itſelf. Among the Hurons and Natchez, the dignity of the chief is hereditary, and the right of ſucceſſion in the female line. When this happens to be extinct, the moſt reſpectable matron of the tribe makes choice of whom ſhe pleaſes to ſucceed. The Cherokees are governed by ſeveral ſachems or chiefs, elected by the different villages as are alſo the Creeks and Chactaws. The two latter puniſh adultery in a woman, by cutting off her hair which they will not ſuffer to grow, till the corn is ripe the next ſeaſon; but the Illinois, for the ſame crime, cut off the women's noſes and ears. The Indians on the lakes are formed into a ſort of empire; and the Emperor is elected from the eldeſt tribe, which is that of the Ottowawas. He has the greateſt authority of any chief that has appeared on the continent, at leaſt, within theſe two centuries. A few years ago, the perſon who held this rank, formed a deſign of uniting all the Indian nations under his ſovereignty; but he miſcarried in the attempt.

Americans, Hospitality of the. Their manner of entering one another's villages has likewiſe its rules. It is reckoned uncivil in travelling ſtrangers to enter a village abruptly, without giving notice of their approach. Therefore as ſoon as they arrive within hearing, they ſtop and hollow, remaining there till invited to enter. Two old men uſually come out to them and lead them in. There is in every village a vacant dwelling, called the *ſtranger's houſe*. Here they are placed, while the old men go round from hut to hut, acquainted the inhabitants that ſtrangers are arrived, who are probably hungry and weary; and every one ſends them what he can ſpare of victuals, and ſkins to repoſe on. When the ſtrangers are refreſhed, pipes and tobacco are brought; and then, but not before, converſation begins, with inquiries who they are, whither bound, what news, &c. and it uſually ends with offers of ſervice: if the ſtrangers have occaſion for guides, or any neceſſaries for continuing their journey; and nothing is exacted for the entertainment. The ſame hoſpitality, eſteemed among them as a principal virtue is practiſed by private perſons; of which Conrad Weiſer gave Dr. Franklin the following inſtance: He had been naturalized among the Six Nations, and ſpoke well the Mohock language. In going through the Indian country, to carry a meſſage from the governor to the council at Onondaga, he called at the habitation of Canaſſetego, an old acquaintance, who embraced him, ſpread furs for him to ſit on, placed before him ſome boiled beans and veniſon, and mixed ſome rum and water for his drink. When he was well refreſhed, and had lit his pipe, Canaſſetego began to converſe with him: aſked how he had fared the many years ſince they had ſeen each other, whence he then came, what had occaſioned the journey, &c. Conrad anſwered all his queſtions; and when the diſcourſe began to flag, the Indian, to continue it, ſaid, "Conrad, you have lived long among the white people, and know ſomething of their cuſtoms; I have been ſometimes at Albany, and have obſerved, that once in ſeven days, they ſhut up their ſhops, and aſſemble all in the great houſe; tell me what it is for? "What do they do there?" "They meet there," ſays Conrad, "to hear and learn *good things*." "I do not doubt," ſays the Indian, "that they tell you ſo; they have told me the ſame: but I doubt the truth of what they ſay, and I will tell you my reaſons. I went lately to Albany to ſell my ſkins, and buy blankets, knives, powder, rum, &c. You know I generally uſed to deal with Hans Hanſon; but I was a little inclined this time to try ſome other merchants. However, I called firſt upon Hans, and aſked what he would give for beaver. He ſaid he could not give more than 4s. a pound; but (ſays he) I cannot talk on buſineſs now; this is the day when we meet together to learn *goods things*, and I am going to the meeting. So I thought to myſelf, ſince I cannot do any buſineſs to-day, I may as well go to the meeting too; and I went with him. There ſtood up a man in black, and began to talk to the people very angrily. I did not underſtand what he ſaid; but perceiving that he looked much at me and at Hanſon, I imagined he was angry at ſeeing me there: ſo I went out, ſat down near the houſe, ſtruck fire, and lit my pipe, waiting till the meeting ſhould break up. I thought too, that the man had mentioned ſomething of beaver, and I ſuſpected that it might be the ſubject of their meeting. So, when they came out, I accoſted my merchant. Well, Hans, (ſays I) I hope you have agreed to give more than 4s. a pound?" "No, (ſays he) I cannot give ſo much, I cannot give more than 3s. and 6d." "I then ſpoke to ſeveral other dealers, but they all ſung the ſame ſong, three and ſix-pence, three and ſix-pence. This made it clear to me that my ſuſpicion was right; and that whatever they pretended of meeting to learn *good things*, the real purpoſe was, to conſult how to cheat Indians in the price of beaver. Conſider but a little, Conrad, and you muſt be of my opinion. If they met ſo often to learn *good things*, they certainly would have learned ſome before this time. But they are ſtill ignorant. You know our practice. If a white man in travelling through our country, enters one of our cabins, we all treat him as I treat you; we dry him if he is wet, we warm him if he is cold, and give him meat and drink, to allay his thirſt and hunger; and we ſpread ſoft furs for him to reſt and ſleep on: We demand nothing in return. But if I go into a white man's houſe at Albany, and aſk for victuals and drink, they ſay, Where is your money? And if I have none, they ſay, Get out, you Indian dog. You ſee they have not yet learned thoſe little *good things* that we need no meeting to be inſtructed in; becauſe our mothers taught them to us when we were children; and therefore it is impoſſible their meetings ſhould be, as they ſay, for any ſuch purpoſe, or have any ſuch effect, they are only to contrive *the cheating of Indians in the price of beaver.*"

AMERICANS, INGENUITY OF THE. Indians are unacquainted with letters, and their hiſtory is preſerved in ſome few inſtances by hieroglyphic paintings, and ſculpture, but principally by tradition. They often diſcover great ingenuity, in communicating information to the abſent. Of the following inſtance of Indian hieroglyphic writing, Dr. Mitchill was an eye-witneſs. The Doctor in company with ſeveral other gentlemen, as they were proceeding up the Onondago river, to an Indian treaty, overtook ſeveral canoes of Seneca Indians, who encamped with them at night near Fort Brewington; and the next day proving rainy, they continued in company till the weather became ſo favourable as to permit them to croſs the Oneida Lake. During the ſtorm, one of the Indian canoes ſtove, and became unfit for ſervice. The commiſſioners took the crew on board their boat, and carried them to a landing-place ſome diſtance up Wood-Creek. Here one of them, before he left the water, took the following method to let his companions, who were left behind, know when and whither they had proceeded. He took a piece of wood, and hewed it flat and ſmooth, and then raked his fire for a ſuitable coal, with which he rudely delineated, on the ſlab, the figure of an Indian, carrying a gun reverſed upon his ſhoulder. In front of him he drew a crooked line, which reached to a man with a long coat and cocked hat, and holding a cane in his hand; and behind him a framed houſe. He then took a ſtrait pole, and tied ſome weeds and graſs upon one end of it, and fixed the other in the earth, in ſuch a manner, that, in the poſition the ſun then was, which was 6 o'clock in the morning, it caſt no ſhadow; or, in other words, he pointed it exactly towards the ſun. The meaning of all, was this—"Suſquewewah (the name of the Indian) left this ſpot at 6 o'clock in the morning, or when the ſun was in the place where the pole pointed, and has proceeded up Wood Creek, (which is remarkably crooked) to the ſettlement where the commiſſioners of the State of N. Y. are aſſembled to hold a treaty with the Indians."--All theſe *inſignia* were arranged ſo conſpicuouſly on the margin of the creek, that his companions behind could ſcarcely avoid obſerving them as they paſſed.

AMERICANS, INSENSIBILITY OF THE, TO PAIN AND COLD. The whole race of American Indians is diſtinguiſhed by thickneſs of ſkin and hardneſs of fibres; circumſtances which probably contribute to that inſenſibility to bodily pain for which they are remarkable. An inſtance of this inſenſibility occurred in an Indian who was under the neceſſity of being cut for the ſtone, and in whoſe caſe the operation was prolonged to the uncommon period of 27 minutes. Yet all this time he gave no tokens of the extreme pain attending this operation; he complained only as a perſon does who feels ſome ſlight uneaſineſs. Two days after, he expreſſed a deſire for food, and on the 8th day quitted his bed, free from pain, although the wound was not yet thoroughly cloſed. The ſame want of ſenſibility is obſerved in caſes of fractures, wounds and other accidents. In all theſe caſes their cure is eaſily effected, and they ſeem to ſuffer leſs than any other race of men. The ſkulls that have been taken up in their ancient burying-grounds are of a greater thickneſs than that bone is commonly found, being from ſix to ſeven inches from the outer to the inner ſuperfices. The ſame is remarked as to the thickneſs of their ſkins. It is natural to infer from hence, that their inſenſibility to pain is owing to a coarſer and ſtronger organization, than that of other people. The eaſe with which they endure the ſeverities of climate is another proof of this. The inhabitants of the higher parts of Peru live amidſt perpetual froſt and ſnow. Although their clothing is very light, they ſupport this inclement temperature without the leaſt inconvenience. Habit indeed may contribute to this, but much is alſo to be aſcribed to the compact texture of their ſkin, which defends them from the impreſſion of cold through their pores. The northern Indians reſemble them in this reſpect. The utmoſt rigours of the winter ſeaſon do not prevent them from following the chace almoſt naked. It is true, they wear a kind of woollen cloak, or ſometimes the ſkin of a wild beaſt, upon their ſhoulders; but, beſides that it covers only a ſmall part of their body; they uſe it rather for ornament than warmth; as they wear it indiſcriminately, in the ſeverities of winter and in the ſultry heats of ſummer, when neither Europeans or Negroes can ſuffer any but the ſlighteſt clothing. They even frequently throw aſide this cloak when they go a-hunting, that it may not embarraſs th[illegible] traverſing their foreſts, where the thorns would take [illegible] of it, which ſlide ſmoothly over their naked bodies. As all times they go with their heads uncovered, without ſuffering the leaſt inconvenience, either from the cold, or from thoſe *coups de ſoleil*, which in Louiſiana are ſo fatal to the inhabitants of other climates. The inhabitants of South-America, compared with thoſe of North-America, are deſcribed as generally more feeble in their frame; leſs vigorous in the efforts of their mind; of gentler diſpoſitions, more addicted to pleaſure, and ſunk in indolence. This, however, is not univerſally the caſe. Many of their nations are as intrepid and enterpriſing as any others on the whole continent. Among the tribes on the banks of the Oroonoko, if a warrior aſpires to the poſt of captain, his probation begins with a long faſt, more rigid than any obſerved by the moſt abſtemious hermit. At the cloſe of this the chiefs aſſemble; and each gives him three laſhes with a large whip, applied ſo vigorouſly, that his body is almoſt flayed. If he betrays the leaſt ſymptom of impatience, or even of ſenſibility, he is diſgraced for ever, and rejected as unworthy of the honor. After ſome interval, his conſtancy is proved by a more excruciating trial. He is laid in his hammock, with his hands bound faſt, and an innumerable multitude of venomous ants, whoſe bite occaſions a violent pain and inflammation, are thrown upon him. The judges of his merit ſtand around the hammock; and whilſt theſe cruel inſects faſten upon the moſt ſenſible parts of his body, a ſigh, a groan, or an involuntary motion expreſſive of what he ſuffers, would exclude him from the dignity of which he is ambitious. Even after this evidence, his fortitude is not deemed to be ſufficiently aſcertained, till he has ſtood another teſt more ſevere, if poſſible, than the former. He is again ſuſpended in his hammock, and covered with the leaves of Palmetto. A fire of ſtinking herbs is kindled underneath, ſo as he may feel its heat, and be involved in ſmoke. Though ſcorched and almoſt ſuffocated, he muſt continue to endure this with the ſame inſenſibility. Many periſh in this eſſay of their firmneſs and courage; but ſuch as go through it with applauſe, receive the enſigns of their new dignity with much ſolemnity, and are ever after regarded as leaders of approved reſolutition, whoſe behaviour, in the moſt trying ſituations, will do honor to their country. In North-America the trial of a warrior is neither ſo formal nor ſo ſevere: Though, even there, before a youth is permitted to bear arms, his patience and fortitude are tried by blows, by fire, and by inſults, more intolerable to a haughty ſpirit than either.

AMERICANS, MANNER OF LIVING AMONG THE. Their huts or cabins are made of ſtakes of wood driven into the ground, and covered with branches of trees or reeds. They lie on the floor either on mats or the ſkins of wild beaſts, their diſhes are of timber; but the ſpoons are made of the ſkulls of wild oxen, and their knives of flint. A kettle and a large plate conſtitute almoſt the whole utenſils of the family. Their diet conſiſts chiefly in what they procure by hunting; and ſagamite, or pottage, is likewiſe one of their moſt common kinds of food. The moſt honorable furniture amongſt them is the ſcalps of their enemies; with thoſe they ornament their huts, which are eſteemed in proportion to the number of this ſort of ſpoils.

AMERICANS, MARRIAGES OF THE. Although the women generally bear the laborious part of domeſtic œconomy, their condition is far from being ſo ſlaviſh as it appears. On the contrary, the greateſt reſpect is paid by the men to the female ſex. The women even hold their councils, and have their ſhare in all deliberations which concern the ſtate. Polygamy is practiſed by ſome nations, but is not general. In moſt, they content themſelves with one wife; but a divorce is admitted in caſe of adultery. No nation of the Americans is without a regular marriage, in which there are many ceremonies; the principal of which is, the bride's preſenting the bridegroom with a plate of their corn. The women, though before incontinent, are remarkable for chaſtity after marriage.

AMERICANS, MENTAL QUALITIES OF THE. Chriſtopher Columbus, the diſcoverer of America, gave the following character to Ferdinand and Iſabella, of the firſt Indians he ſaw in the iſland of Hiſpaniola. "I ſwear," he ſays, "to your majeſties, that there is not a better people in the world than theſe, more affectionate, affable, or mild. They love their neighbors as themſelves; their language is the ſweeteſt, the ſofteſt, and the moſt cheerful; for they always ſpeak ſmiling; and although they go naked, let your majeſties believe me, their cuſtoms are very becoming; and their king, who is ſerved with great majeſty, has ſuch engaging manners, that it gives pleaſure to ſee him, and alſo to conſider the great retentive faculty of that people, and their deſire of knowledge, which incites them to aſk the cauſes and the effects of things." The Abbe Clavigero ſays, "We have had intimate commerce with the Americans; have lived for ſome years in a ſeminary deſtined for their inſtruction; ſaw the erection and progreſs of the royal college of Gaudaloupe founded in Mexico, by a Mexican Jeſuit, for the education of Indian children; had afterwards ſome Indians amongſt our pupils; had particular knowledge of many American rectors, many nobles, and numerous artiſts; attentively obſerved their character, their genius, their diſpoſition, and manner of thinking; and have examined beſides with the utmoſt diligence their ancient hiſtory, their religion, their government, their laws, and their cuſtoms. After ſuch long experience and ſtudy of them, from which we imagine ourſelves enabled to decide without danger of erring, we declare to M. de Paw, and to all Europe, that the mental qualities of the Americans are not in the leaſt inferior to thoſe of the Europeans; that they are capable of all, even the moſt abſtract ſciences; and that if equal care was taken of their education, if they were brought up from childhood in ſeminaries under good maſters, were protected and ſtimulated by rewards, we ſhould ſee riſe among the Americans, philoſophers, mathematicians, and divines, who would rival the firſt in Europe." But although we ſhould ſuppoſe, that, in the torrid climates of the New World, as well as in thoſe of the Old, eſpecially under the additional depreſſion of ſlavery, there was an inferiority of the mental powers, the Chileſe and the North-Americans have diſcovered higher rudiments of human excellence and ingenuity than have ever been known among tribes in a ſimilar ſtate of ſociety in any other part of the world. It has been affirmed, that ſtone bridges were unknown to America when it was firſt diſcovered; and that the natives did not know how to form arches. But theſe aſſertions are erroneous. The remains of the ancient palaces of Texcuco, and ſtill more their vapour baths, ſhow the ancient uſe of arches and vaults among the Mexicans. But the ignorance of this art would have been no proof of barbarity. Neither the Egyptians nor Babylonians underſtood the conſtruction of arches. The advance, which the Mexicans have made in the ſtudy of aſtronomy is perhaps the moſt ſurpriſing proof of their attention and ſagacity: for it appears from Abbe Clavigero's hiſtory, that they not only counted 365 days to the year, but alſo knew of the exceſs of about ſix hours in the ſolar over the civil year, and remedied the difference by means of intercalary days. See Astronomy.

Americans, morality of the. Of American morality, the following exhortation of a Mexican to his ſon may ſerve as a ſpecimen. "My ſon, who art come into the light from the womb of thy mother like a chicken from the egg, and like it art preparing to fly through the world, we know not how long Heaven will grant to us the enjoyment of that precious gem which we poſſeſs in thee; but however ſhort the period, endeavor to live exactly, praying God continually to aſſiſt thee. He created thee: thou art his property. He is thy father, and loves thee ſtill more than I do; repoſe in him thy thoughts, and day and night direct thy ſighs to him. Reverence and ſalute thy elders, and hold no one in contempt. To the poor and diſtreſſed be not dumb, but rather uſe words of comfort. Honor all perſons particularly thy parents, to whom thou oweſt obedience, reſpect and ſervice. Guard againſt imitating the example of thoſe wicked ſons, who, like brutes that are deprived of reaſon, neither reverence their parents, liſten to their inſtructions, nor ſubmit to their correction; becauſe whoever follows their ſteps will have an unhappy end, will die in a deſperate or ſudden manner, or will be killed and devoured by wild beaſts. Mock not, my ſon, the aged or imperfect. Scorn not him whom you ſee fall into ſome folly or tranſgreſſion, nor make him reproaches; but reſtrain thyſelf, and beware leſt thou fall into the ſame error which offends thee in another. Go not where thou art not called, nor interfere in that which does not concern thee. Endeavor to manifeſt thy good breeding in all thy words and actions. In converſation, do not lay thy hands upon another, nor ſpeak too much, nor interrupt or diſturb another's diſcourſe. When one diſcourſes with thee hear him attentively, and hold thyſelf in an eaſy attitude, neither playing with thy feet, nor putting thy mantle into thy mouth, nor ſpitting too often, nor looking about you here and there, nor riſing up frequently if thou art ſitting; for ſuch actions are indications of levity and low breeding."—He proceeds to mention ſeveral particular vices which are to be avoided, and concludes—"Steal not, nor give thyſelf to gaming; otherwiſe thou wilt be a diſgrace to thy parents, whom thou oughteſt rather to honor for the education they have given thee. If thou wilt be virtuous, thy example will put the wicked to ſhame. No more, my ſon; enough hath been ſaid in diſcharge of the duties of a father. With theſe counſels I wiſh to fortify thy mind. Refuſe them not, nor act in contradiction to them; for on them thy life and all thy happineſs depends."

Americans, politeness of the. The politeneſs of the American Indians, in converſation is carried to exceſs; ſince it does not permit them to contradict or deny the truth of what is aſſerted in their preſence. By this means they indeed avoid diſputes; but then it becomes difficult to know their minds, or what impreſſion you make upon them. The miſſionaries who have attempted to convert them to Chriſtianity, all complain of this as one of the greateſt difficulties of their miſſion. The Indians hear with patience the truths of the goſpel explained to them, and give their uſual tokens of aſſent and approbation; but this by no means implies conviction; it is merely civility. When any of them come into our towns, our people are apt to crowd round them, gaze upon them, and incommode them where they deſire to be private; this they eſteem great rudeneſs, and the effect of the want of inſtruction in the rules of civility and good manners. "We have," ſay they, "as much curioſity as you; and when you come to our towns, we wiſh for opportunities for looking at you; but for this purpoſe we hide ourſelves behind buſhes where you are to paſs, and never intrude ourſelves into your company."

Americans, punishments among the. Controverſies among the Indians are but few, and quickly decided. When any criminal matter is ſo flagrant as to become a national concern, it is brought under the juriſdiction of the great council; but in ordinary caſes, the crime is either revenged or compromiſed by the parties concerned. If a murder be committed, the family which has loſt a relation prepares to retaliate on that of the offender. They often kill the murderer; when this happens, the kindred of the laſt perſon ſlain look upon themſelves to be as much injured, and to have the ſame right to vengeance, as the other party. In general, however, the offender abſents himſelf; the friends ſend compliments of condolence to thoſe of the perſon that has been murdered. The head of the family at length appears with a number of preſents, the delivery of which he accompanies with a formal ſpeech. The whole ends, as uſual, in mutual feaſtings, ſongs and dances. If the murder is committed by one of the ſame family or cabin, that cabin has the full right of judgment within itſelf, either to puniſh the guilty with death, or to pardon him, or to oblige him to give ſome recompence to the wife or children of the ſlain. Inſtances of ſuch a crime, however, very ſeldom happen; for their attachment to thoſe of the ſame family is remarkably ſtrong, and is ſaid to produce ſuch friendſhips as may vie with the moſt celebrated in real or fabulous antiquity.

Americans, strength of the. Nothing demonſtrates ſo clearly the robuſtneſs of the Americans, as thoſe various and laſting fatigues in which they are continually engaged. M. de Paw ſays, that when the New World was diſcovered, nothing was to be ſeen but thick woods; that at preſent there are ſome lands cultivated, not by the Americans, but by the Africans and Europeans; and that the ſoil in cultivation is to the ſoil which is uncultivated as 2000 to 2,000,000. Theſe three aſſertions the Abbe Clavigero demonſtrates to be as many errors. Since the conqueſt, the Americans alone have been the people who have ſupported all the fatigues of agriculture in all the vaſt and uncultivated countries of the continent of South-America ſubject to Spain. No European is ever to be ſeen employed in the labors of the field. The Moors who, in compariſon of the Americans, are very few in number in the kingdom of New-Spain, are charged with the culture of the ſugar-cane and tobacco, and the making of ſugar; but the ſoil deſtined for the cultivation of thoſe plants is not with reſpect to all the cultivated land of that country in the proportion of one to two thouſand. The Americans are the people who labor on the ſoil. They are the tillers, the ſowers, the weeders, and the reapers of the wheat, of the maize, of the rice, of the beans, and other kinds of grain and pulſe, of the cacao, of the vanilla, of the cotton, of the indigo, and all other plants uſeful to the ſuſtenance, the clothing, and commerce of thoſe provinces; and without them ſo little can be done, that in 1762, the harveſt of wheat was abandoned in many places on account of a ſickneſs that prevailed and prevented the Indians from reaping it. But this is not all; the Americans cut and tranſport all the neceſſary timber from the woods; cut, tranſport, and work the ſtones; they make lime, plaſter, and tiles; and conſtruct all the buildings of that kingdom, except a few places where none of them inhabit; they alſo open and repair all the roads, make the canals and ſluices, and clean the cities. They work in many mines of gold, of ſilver, of copper, &c. they are the ſhepherds, herdſmen, weavers, potters, baſket-makers, bakers, curriers, day laborers, &c. in a word, they are the perſons who bear all the burden of public labors. Theſe, ſays our juſtly indignant author, are the employments of the weak, daſtardly, and uſeleſs Americans; while the *vigorous* M. de Paw, and other indefatigable Europeans, are occupied in writing invectives againſt them.

Americans, superſtitions among the. Their taſte for war, which forms the chief ingredient in their character, gives a ſtrong bias to their religion. Areſkoui, or the god of battle, is revered as the great god of the Indians. Him they invoke before they go into the field; and according as his diſpoſition is more or leſs favorable to them, they conclude they will be more or leſs ſucceſsful. Some nations worſhip the ſun and moon; among others, there are a number of traditions, relative to the creation of the world and the hiſtory of the gods: traditions which reſemble the Grecian fables, but which are ſtill more abſurd and inconſiſtent. But religion is not the prevailing character of the Indians; and except when they have ſome immediate occaſion for the aſſiſtance of their gods, they pay them no ſort of worſhip. Like all rude nations, however, they are ſtrongly addicted to ſuperſtition. They believe in the exiſtence of a number of good and bad genii or ſpirits, who interfere in the affairs of mortals, and produce all our happineſs or miſery. It is from the evil genii, in particular, that our diſeaſes proceed; and it is to the good genii we are indebted for a cure. The miniſters of the genii are the jugglers, who are alſo the only phyſicians among the ſavages. Theſe jugglers are ſuppoſed to be inſpired by the good genii, moſt commonly in their dreams, with the knowledge of future events; they are called in to the aſſiſtance of the ſick, and are ſuppoſed to be informed by the genii whether they will get over the diſeaſe, and in what way they muſt be treated. But theſe ſpirits are extremely ſimple in their ſyſtem of phyſic, and, in almoſt every diſeaſe, direct the jugglers to the ſame remedy. The patient is incloſed in a narrow cabin, in the midſt of which is a ſtone red-hot; on this they throw water, until he is well ſoaked with the warm vapor and his own ſweat. Then they hurry him from this bagnio, and plunge him ſuddenly into the next river. This coarſe method, which coſts many their lives, often performs many extraordinary cures. The jugglers have likewiſe the uſe of ſome ſpecifics of wonderful efficacy; and all the ſavages are dexterous in curing wounds by the application of herbs. But the power of theſe remedies are always attributed to the magical ceremonies with which they are adminiſtered.

Americans, their treatment of priſoners. We have already mentioned the ſtrength of their affections or reſentments. United as they are in ſmall ſocieties, connected within themſelves by the firmeſt ties, their friendly affections, which glow with the moſt intenſe warmth within the walls of their own village, ſeldom extend beyond them. They feel nothing for the enemies of their nation; and their reſentment is eaſily extended from the individual who has injured them to all others of the ſame tribe. The priſoners, who have, themſelves, the ſame feelings, know the intentions of their conquerors, and are prepared for them. The perſon who has taken the captive attends him to the cottage, where, according to the diſtribution made by the elders, he is to be delivered to ſupply the loſs of a citizen. If thoſe who receive him have their family weakened by war or other accidents, they adopt the captive into the family, of which he becomes a member. But if they have no occaſion for him, or their reſentment for the loſs of their friends be too high to endure the ſight of any connected with thoſe who were concerned in it, they ſentence him to death. The chiefs being collected, after the pronouncing of this ſevere ſentence, the whole nation is aſſembled at the execution, as for ſome great ſolemnity. A ſcaffold is erected, and the priſoners are tied to the ſtake, where they commence their death-ſong, and prepare for the enſuing ſcene of cruelty with the moſt undaunted courage. Their enemies on the other ſide, are determined to put it to the proof, by the moſt refined and exquiſite tortures. They begin at the extremity of his body, and gradually approach the more vital parts, One plucks out his nails by the roots, one by one; another takes a finger into his mouth, and tears off the fleſh with his teeth; a third thruſts the finger, mangled as it is, into the bowl of a pipe made red-hot, which he ſmokes like tobacco; then they pound his toes and fingers to pieces between two ſtones; they cut circles about his joints, and gaſhes in the fleſhy parts of his limbs, which they ſear immediately with red-hot irons, cutting, burning, and pinching them alternately; they pull off the fleſh thus mangled and roaſted, bit by bit, ſmearing their faces with the blood in an enthuſiaſm of horror and fury. When they have thus torn off the fleſh, they twiſt the bare nerves and tendons about an iron, tearing and ſnapping them, whilſt others are employed in pulling and extending their limbs in every way that can increaſe the torment. This continues often five or ſix hours: and ſometimes, ſuch is the ſtrength of the ſavages, days together. Then they frequently unbind him, to think what new torments they ſhall inflict, and to reſeſh the ſtrength of the ſufferer. He is now again faſtened to the ſtake, and again they renew their cruelty; they ſtick him all over with ſmall matches of wood that eaſily take fire, but burn ſlowly; they continually run ſharp reeds into every part of his body; they drag out his teeth with pincers, and thruſt out his eyes; and laſtly, after having burnt his fleſh from the bones with ſlow fires; after having ſo mangled the body that it is all but one wound; they once more unbind the wretch; who, blind and ſtaggering with pain and weakneſs, aſſaulted and pelted upon every ſide with clubs and ſtones, now up, now down, falling into their fires at every ſtep, runs hither and thither, until one of the chiefs, whether out of compaſſion, or weary of cruelty, puts an end to his life with a club or dagger. The body is then put into a kettle, and this barbarous employment is ſucceeded by a feaſt as barbarous. The women, forgetting the human as well as the female nature, transformed into worſe than furies, even out do the men in this ſcene of horror; while the principal perſons of the country ſit round the ſtake, ſmoking and looking on without the leaſt emotion. What is moſt extraordinary, the ſufferer himſelf, in the little intervals of his torments, ſmokes too, appears unconcerned, and converſes with his torturers about indifferent matters. Indeed, during the whole time of his execution, there ſeems a conteſt which ſhall exceed, they inflicting the moſt horrid pains, or he in enduring them with a firmneſs and conſtancy almoſt above human: not a groan, not a ſigh, not a diſtortion of countenance eſcapes him; he poſſeſſes his mind entirely in the midſt of his torments; he recounts his own exploits; he informs them what cruelties he has inflicted upon their countrymen, and threatens them with the revenge that will attend his death; and, though his reproaches exaſperate them to a perfect madneſs of rage and fury, he continues his inſults even of their ignorance of the art of tormenting, pointing out himſelf more exquiſite methods, and more ſenſible parts of the body to be afflicted. The women have this part of courage as well as the men; and it is as rare for an Indian to behave otherwiſe as it would be for an European to ſuffer as an Indian. Such is the wonderful power of an early education, and a ferocious thirſt of what is falſely deemed glory. But neither the intrepidity on the one ſide, nor the inflexibility on the other, are among themſelves matters of aſtoniſhment: for vengeance, and fortitude in the midſt of torment, are duties which they conſider as ſacred.

Americans, virtues of the. Except in the treatment of their priſoners, the American Indians are on all occaſions humane and compaſſionate. Nothing can exceed the warmth of their affection towards their friends, who conſiſt of all thoſe who live in the ſame village, or are in alliance with it: among theſe all things are common; and this, though it may in part ariſe from their not poſſeſſing very diſtinct notions of ſeparate property, is chiefly to be attributed to the ſtrength of their attachment; becauſe in every thing elſe, with their lives as well as their fortunes, they are ready to ſerve their friends. Their houſes, their proviſion, even their young women, are not enough to oblige a gueſt. Has any one of theſe ſucceeded ill in his hunting? Has his harveſt failed? or is his houſe burned? He feels no other effect of his misfortunes, than that it gives him an opportunity to experience the benevolence and regard of his fellow-citizens. If on the whole, we contraſt their generoſity towards their friends, with their implacability towards their enemies, we ſhall find with the Americans as the Greeks of old,

"*A generous friendſhip, no cold medium knows*
"*But with one love with one reſentment glows;*"

and ſuch indeed, in general, is the character of all ſtrong and uncultivated minds.

Americans, wars of the. War, if we except hunting, is the only employment of the men; as to every other concern and even the little agriculture they enjoy, it is left to the women. Their moſt common motive for entering into war, when it does not ariſe from an accidental rencounter or interference, is either to revenge themſelves for the death of ſome loſt friends, or to acquire priſoners, who may aſſiſt them in their hunting, and whom they adopt into their ſociety. Theſe wars are either undertaken by ſome private adventurers, or at the inſtance of the whole community. In the latter caſe, all the young men who are diſpoſed to go out to battle, (for no one is compelled contrary to his inclination,) give a bit of wood to the chief, as a token of their deſign to accompany him; for every thing among theſe people is tranſacted with a great deal of ceremony. The chief who is to conduct them faſts ſeveral days, during which he converſes with no one, and is particularly careful to obſerve his dreams; which the preſumption natural to ſavages generally renders as favorable as he could deſire. A variety of other ſuperſtitious ceremonies are obſerved. Then they diſpatch a procelane, or large ſhell, to their allies, inviting them to come along, and drink the blood of their enemies. For they think that thoſe in their alliance muſt not only adopt their enmities, but have their reſentment wound up to the ſame pitch with themſelves. Having finiſhed all the ceremonies previous to the war, and the day appointed for their ſetting out on the expedition being arrived, they take leave of their friends, and exchange their clothes, or whatever moveables they have, in token of mutual friendſhip; after which they proceed from the town, their wives and female relations walking before, and attending them to ſome diſtance. The warriors march all dreſſed in their fineſt apparel and moſt ſhowy ornaments, without any order. The chief walks ſlowly before them, ſinging the war ſong, while the reſt obſerve the moſt profound ſilence. When they come up to their women, they deliver them all their finery, and putting on their worſt clothes, proceed on their expedition. Every nation has its peculiar enſign or ſtandard, which is generally ſome beaſt, bird or fiſh. Thoſe among the Five Nations are the bear, otter, wolf, tortoiſe, and eagle; and by theſe means the tribes are uſually diſtinguiſhed. They have the figures of thoſe animals pricked and painted on ſeveral parts of their bodies; and when they march through the woods, they commonly, at every encampment, cut the repreſentation of their enſign on trees, eſpecially after a ſucceſsful campain: marking at the ſame time the number of ſcalps or priſoners they have taken. Their military dreſs is extremely ſingular. They cut off or pull out all their hair, except a ſmall ſpot near the top of their heads, and entirely deſtroy their eyebrows. The lock left upon their heads is divided into ſeveral parcels, each of which is ſtiffened and adorned with wampum, beads, and feathers of various kinds, the whole being twiſted into a form much reſembling the modern pompoon. Their heads are painted red down to the eyebrows, and ſprinkled over with white down. The griſtles of their ears are ſplit almoſt quite round, and diſtended with wires or ſplinters. Their noſes are likewiſe bored and hung with trinkets of beads, and their faces painted with various colours ſo as to make an awful appearance. Their breaſts are adorned with a gorget or medal, of braſs, copper, or ſome other metal; and that dreadful weapon, the ſcalping knife, hangs by a ſtring from their neck. The great qualities in an Indian war are vigilance and attention, to give and to avoid a ſurpriſe; and indeed in theſe they are ſuperior to all nations in the world. Accuſtomed to continual wandering in the foreſts, having their perceptions ſharpened by keen neceſſity, and in every reſpect according to nature, their external ſenſes have a degree of acuteneſs which at firſt view appears incredible. They can trace out their enemies at an immenſe diſtance by the ſmoke of their fires, which they ſmell, and by the tracks of their feet on the ground which they can count and diſtinguiſh with the utmoſt facility. They can even diſtinguiſh the different nations with whom they are acquainted, and can determine the preciſe time when they paſſed, where one of us, even when aſſiſted with glaſſes, could not diſtinguiſh footſteps at all. Theſe circumſtances, however, are of ſmall importance, becauſe their enemies are no leſs acquainted with them. When they go out, therefore, they take care to avoid making uſe of any thing by which they might run the danger of a diſcovery. They light no fire to warm themſelves or to prepare their victuals: they lie cloſe to the ground all day, and travel only in the night; and marching along in files, he that cloſes the rear diligently covers with leaves the tracks of his own feet and of theirs who preceded him. When they halt to refreſh themſelves, ſcouts are ſent out to reconnoitre the country and beat up every place where they ſuſpect an enemy to be concealed. In this manner they enter unawares the villages of their foes; and while the flower of the nation are engaged in hunting, maſſacre all the children, women, and helpleſs old men, or make priſoners of as many as they can manage, or have ſtrength enough to be uſeful to their nation. But when the enemy is appriſed of their deſign, and coming on in arms againſt them, they throw themſelves flat on the ground among the withered herbs and leaves, which their faces are painted to reſemble. Then they allow a part to paſs unmoleſted, when all at once, with a tremendous ſhout, riſing up from their ambuſh, they pour a ſtorm of muſket-bullets on their foes. The party attacked returns the ſame cry. Every one ſhelters himſelf with a tree, and returns the fire of the adverſe party, as ſoon as they can raiſe themſelves from the ground to give a ſecond fire. Thus does the battle continue until the one party is ſo much weakened as to be incapable of a farther reſiſtance. But if the force on each ſide continues nearly equal, the fierce ſpirits of the ſavages, inflamed by the loſs of their friends, can no longer be reſtrained. They abandon their diſtant war, they ruſh upon one another with clubs and hatchets in their hands, magnifying their own courage, and inſulting their enemies with the bittereſt reproaches. A cruel combat enſues, death appears in a thouſand hideous forms, which would congeal the blood of civilized nations to behold, but which rouſe the fury of ſavages. They trample, they inſult over the dead bodies, tearing the ſcalp from the head, wallowing in their blood like wild beaſts, and ſometimes devouring their fleſh. The flame rages on till it meets with no reſiſtance; then the priſoners are ſecured, thoſe unhappy men, whoſe fate is a thouſand times more dreadful than theirs who have died in the field. The conquerors ſet up a hideous howling to lament the friends they have loſt. They approach in a melancholy and ſevere gloom to their own village; a meſſenger is ſent to announce their arrival, and the women, with frightful ſhrieks, come out to mourn their dead brothers or their huſbands. When they are arrived, the chief relates in a low voice to the elders, a circumſtantial account of every particular of the expedition. The orator proclaims aloud this account of the people; and as he mentions the names of thoſe who have fallen, the ſhrieks of the women are redoubled. The men too join in theſe cries, according as each is moſt connected with the deceaſed by blood or friendſhip. The laſt ceremony is the proclamation of the victory; each individual then forgets his private misfortunes, and joins in the triumph of his nation; all tears are wiped from their eyes, and by an unaccountable tranſition, they paſs in a moment from the bitterneſs of ſorrow to an extravagance of joy. But the treatment of the priſoners, whoſe fate all this time remains undecided, is what chiefly characteriſes the ſavages.

AMERICAN INDIANS, WHETHER THEY BE A RACE RADICALLY DIFFERENT FROM OTHERS CONSIDERED? After having deſcribed the general character of the American Indians, a queſtion naturally occurs, whether their peculiarities or the diſparity between them and the inhabitants of Europe, afford ſufficient grounds for determining them, as ſome have done, to be a race of men radically different from all others.

In this queſtion, to avoid being tedious, we ſhall confine ourſelves to what has been advanced by Lord Kames; who is of opinion, that there are many different ſpecies of men, as well as of other animals; and gives an hypotheſis, whereby he pretends his opinion may be maintained in a conſiſtency with Revelation. “ If (ſays he) the only rule afforded by nature for claſſing animals can be depended on, there are different races of men as well as of dogs: a maſtiff differs not more from a ſpaniel, than a white man from a negro, or a Laplander from a Dane. And, if we have any faith in Providence, it ought to be ſo. Plants were created of different kinds, to fit them for different climates; and ſo were brute animals. Certain it is, that all men are not fitted equally for every climate. There is ſcarce a climate but what is natural to ſome men, where they proſper and flouriſh; and there is not a climate but where ſome men degenerate. Doth not then analogy lead us to conclude, that, as there are different climates on the face of this globe, ſo there are different races of men fitted for theſe different climates?

“ M. Buffon, from the rule, that animals which can procreate together, and whoſe progeny can alſo procreate, are of one ſpecies; concludes, that all men are of one race or ſpecies, and endeavors to ſupport that favourite opinion, by aſcribing to the climate, to food, or to other accidental cauſes, all the varieties that are found among men. But is he ſeriouſly of opinion, that any operation of climate, or of other accidental cauſe, can account for the copper-colour and ſmooth chin ſo univerſal among the Americans; the prominence of the pudenda among the Hottentot women, or the black nipple ſo univerſal among the female Samoiedes? It is in vain to aſcribe to the climate, the low ſtature of the Eſquimaux, the ſmallneſs of their feet, or the overgrown ſize of their heads. It is equally in vain to aſcribe to cli-

[illegible] inhabitants [illegible] light. [illegible] on the contrary [illegible] features [illegible] differ- [illegible]

[illegible] hypothesis concerning [illegible] the inhabitants [illegible] and northern [illegible] than that of the people [illegible] beyond other Europeans. [illegible] people pre- serving [illegible] climates very different from their own [illegible] the contrary, as [illegible] complete generations of negroes [illegible] without any visible change of colour [illegible] as originally. [illegible] probable [illegible] parents should be [illegible] children, who never saw the [illegible] German [illegible] the negro colour [illegible] the skin [illegible] the children [illegible] the same complexion [illegible] Europe. [illegible] possible to ex- [illegible] day."

[illegible] draw some arguments for a diversity of [illegible] races of men, from the various [illegible] which he [illegible] differences, as well as [illegible] colour, features, &c. [illegible] evidence, we con- [illegible] the whole particulars mentioned above, would [illegible] to adopt the following [illegible] contradicting [illegible] created many pairs of the human [illegible] extremely [illegible] different climates, and placed each pair in its proper [illegible], that the [illegible] of the original pairs [illegible] entire [illegible] who, having no [illegible] their [illegible] were left to gather knowledge from ex- perience, and, in particular, were left [illegible] to form a language for [illegible] sufficient for the [illegible] language [illegible] nature [illegible] gradually. [illegible] opinion, how- ever plausible, we are not permitted to adopt; being taught a different lesson by revelation, viz. That God created but a single pair of the human species. That different races of men were not formed, nor were even formed originally for different climates. All men must have spoken the same language, [illegible] our first parents. And what of all [illegible] to that system, is the savage state [illegible] in Moses [illegible] degree of knowledge [illegible] their [illegible] among [illegible] Whence then the degeneracy [illegible] of that [illegible] must have suffered some terrible convulsion. That [illegible] revealed to us in the history of the tower of Babel, contained in the 11th chapter of Genesis, which is, That for many centuries after the deluge, the whole earth was of one language, and of one speech; that they united to build a city on a plain in the land of Shinar, with a tower whose top might reach unto heaven: That the Lord beholding the people to be one, and to have all one language, and that nothing would be restrained from them which they imagined to do, confounded their language, that they might not understand one another, and scattered them abroad upon the face of all the earth." Here light breaks forth in the midst of darkness. By confounding the language of men, and scattering them abroad upon the face of all the earth, they were rendered savages. And to harden them for their new habitations, it was necessary that they should be divided into different kinds, fitted for different climates. Without an immediate change of constitution, the builders of Babel could not possibly have subsisted in the burning region of Guinea, nor in the frozen region of Lapland; houses not being prepared, nor any other convenience to protect them against a destructive climate."

We may first remark, on his Lordship's hypothesis, that it is evidently incomplete: for, allowing the human race to have been divided into different species at the confusion of languages, and that each species was adapted to a particular climate; by what means were they to get to the climates proper for them, or how were they to know that such climates existed? How was an American, for instance, when languishing in an improper climate at Babel, to get to the land of Amazons, or the banks of the Oroonoko, or his own country? or how was he to know that these places were more proper for him than others?—If, indeed, we take the scripture phrase, "The Lord *scattered them abroad* upon the face of all the earth," in a certain sense, we may account for it. If we suppose that the different species were immediately carried off by a whirlwind, or other supernatural means, to their proper countries, the difficulty will vanish: but if this is his Lordship's interpretation, it is certainly a very singular one.

Before entering upon a consideration of the particular arguments used by our author for proving the diversity of species in the human race, it will be proper to lay down the following general principles, which may serve as axioms. 1. When we assert a multiplicity of species in the human race; we bring in a supernatural cause to solve a natural phenomenon: for these species are supposed to be the immediate work of the Deity. 2. No person has a right to call any thing the immediate effect of omnipotence, unless by express revelation from the Deity, or from a certainty that no natural cause is sufficient to produce the effect. The reason is plain. The Deity is invisible, and so are many natural causes: when we see an effect therefore, of which the cause does not manifest itself, we cannot know whether the immediate cauſe is the Deity, or an inviſible natural power. An example of this we have in this phenomena of thunder and earthquakes, which were often aſcribed immediately to the Deity, but are now diſcovered to be the effects of electricity. 3. No perſon can aſſert natural cauſes to be inſufficient to produce ſuch and ſuch effects, unleſs he perfectly knows all theſe cauſes, and the limits of their power in all poſſible caſes; and this no man has ever known, or can know.

By keeping in view theſe principles, which we hope are ſelf-evident, we will eaſily ſee Lord Kame's arguments to conſiſt entirely in a *begging of the queſtion*. In ſubſtance they are all reduced to this ſingle ſentence: "Natural philoſophers have been hitherto unſucceſsful in their endeavors to account for the differences obſerved among mankind, therefore theſe differences cannot be accounted for from natural cauſes."

His Lordſhip, however, tells us in the paſſages already quoted, that "a maſtiff differs not more from a ſpaniel, than a Laplander from a Dane;" that "it is vain to aſcribe to climate the low ſtature of the Laplanders, or their ugly viſage." Yet, in a note on the word *Laplanders*, he ſubjoins, that, "by late accounts it appears, that the Laplanders are only degerated Tartars; and that they and the Hungarians originally ſprung from the ſame breed of men, and from the ſame country." The Hungarians are generally handſome and well made, like Danes, or like other people. The Laplanders, he tills us, differ as much from them as a maſtiff from a ſpaniel. Natural cauſes, therefore, according to Lord Kames himſelf, may cauſe two individuals of the ſame ſpecies of mankind to differ from each other as much as a maſtiff does from a ſpaniel.

While we are treating on this ſubject of colour, it may not be amiſs to obſerve, that a very remarkable difference of colour may accidentally happen to individuals of the ſame ſpecies. In the iſthmus of Darien, a ſingular race of men have been diſcovered. They are of low ſtature, of a feeble make, and incapable of enduring fatigue. Their colour is a dead milk white; not reſembling that of fair people among Eurepeans, but without any bluſh or ſanguine complexion. Their ſkin is covered with a fine hairy down of a chalky white; the hair of their heads, their eye-brows, and eye-laſhes, are of the ſame hue. Their eyes are of a ſingular form, and ſo weak, that they can hardly bear the light of the ſun; but they ſee clearly by moon-light, and are moſt active and gay in the night. Among the negroes of Africa, as well as the natives of the Indian iſlands, a ſmall number of theſe people are produced. They are called *Albinos*, by the Portugueſe, and *Kuckerlakes* by the Dutch.

This race of men is not indeed permanent; but it is ſufficient to ſhow, that mere *colour* is by no means the characteriſtic of a certain ſpecies of mankind. The difference of colour in theſe individuals is undoubtedly owing to a natural cauſe. To conſtitute, then, a race of men of this colour, it would only be neceſſary that this cauſe, which at preſent is merely accidental, ſhould become permanent, and we cannot know but it may be ſo in ſome parts of the world.

If a difference in colour is no characteriſtic of a different ſpecies of mankind, much leſs can a difference in ſtature be thought ſo. In the ſouthern parts of America, there are ſaid to be a race of men exceeding the common ſize in height and ſtrength. This account, however, is doubted of by ſome; but be that as it will, it is certain that the Eſquimaux are as much under the common ſize, as the Patagonians are ſaid to be above it. Nevertheleſs we are not to imagine, that either of theſe are ſpecific differences; ſeeing the Laplanders and Hungarians are both of the ſame ſpecies, and yet the former are generally almoſt a foot ſhorter than the latter; and, if a difference of climate, or other accidental cauſes, can make the people of one country a foot ſhorter than the common ſize of mankind, undoubtedly accidental cauſes of a contrary nature may make thoſe of another country a foot taller than other men.

Though the ſun has undoubtedly a ſhare in the production of the ſwarthy colour of thoſe nations which are moſt expoſed to his influence; yet the manner of living to which people are accuſtomed, their victuals, their employment, &c. muſt contribute very much to a difference of complexion. There are ſome kinds of coloring roots, which, if mixed with the food of certain animals, will tinge even their bones of a yellow colour.—It cannot be thought any great degree of credulity to infer from this, that if theſe roots were mixed with the food of a white man, they might, without a miracle, tinge his ſkin of a yellow color. If a man and woman were both to uſe food of this kind for a length of time, till they became as it were *radically dyed*, it is impoſſible, without the intervention of divine power, or of ſome extraordinary natural cauſe, but their children muſt be of the ſame color; and was the ſame kind of food to be continued for ſeveral generations, it is more than probable that this colour might reſiſt the continued uſe of any kind of food whatever. See further the article of COMPLEXION.

Of this indeed we have no examples, but we have an example of changes much more wonderful.—It is allowed on all hands, that it is more eaſy to work a change upon the body of a man, or any other animal, than upon his mind. A man that is naturally choleric may indeed learn to prevent the bad effects of his paſſion by reaſon, but the paſſion itſelf will remain as immutable as his colour. But to reaſon in a manner ſimilar to Lord Kames; though a man be naturally choleric, or ſubject to any other paſſion, why ſhould his children be ſo?—This way of reaſoning, however plauſible, is by no means concluſive, as will appear from the following paſſage in Mr. Forſter's Voyage.

June 9th. "The officers, who could not yet reliſh their ſalt proviſions after the refreſhments of New-Zealand, had ordered their black dog, mentioned p. 135, to be killed: this day, therefore, we dined for the firſt time on a leg of it roaſted; which taſted ſo exactly like mutton, that it was abſolutely undiſtinguiſhable. In our cold countries, where animal food is ſo much uſed, and where to be carnivorous perhaps lies in the nature of men, or is indiſpenſibly neceſſary to the preſervation of their health and ſtrength, it is ſtrange that there ſhould exiſt a Jewiſh averſion to dogs-fleſh, when hogs, the moſt uncleanly of all animals, are eaten without ſcruple. Nature ſeems expreſsly to have intended them for this uſe, by making their offſpring ſo very numerous, and their increaſe ſo quick and frequent. It may be objected, that the exalted degree of inſtinct which we obſerve in our dogs, inſpires us with great unwillingneſs to kill and eat them. But it is owing to the time we ſpend on the education of dogs, that they acquire thoſe eminent qualities which attach them ſo much to us. The natural qualities of our dogs may receive a wonderful improvement; but education muſt give it aſſiſtance, without which the human mind itſelf, though capable of an immenſe expanſion, remains in a very contracted ſtate. In New-Zealand, and (acccording to former accounts of voyages) in the tropical iſles of the South Sea, the dogs are the moſt ſtupid, dull animals imaginable, and not ſeem to have the leaſt advantage in point of ſagacity over our ſheep, which are commonly made the emblems of ſillineſs. In the former country they are fed upon fiſh, in the latter on vegetables, and both theſe diets may have ſerved to alter their diſpoſition. Education may perhaps likewiſe graft new inſtincts; the New-Zealand dogs are fed on the remains of their maſter's meals: they eat the bones of other dogs; and the puppies become true cannibals from their birth. We had a young New-Zealand puppy on board, which had certainly had no opportunity of taſting any thing but the mother's milk before we purchaſed it: however, it eagerly devoured a portion of the fleſh and bones of the dog on which we dined to-day; while ſeveral others of the European breed taken on board at the Cape, turned from it without touching it.

On the fourth of Auguſt, a young bitch, of the terrier breed, taken on board at the Cape of Good Hope, and covered by a ſpaniel, brought ten young ones, one of which was dead. The New-Zealand dog mentioned above, which devoured the bones of a roaſted dog, now fell upon the dead puppy, and ate of it with a ravenous appetite. This is a proof how far education may go in producing and propagating new inſtincts in animals. European dogs are never fed on meat of their own ſpecies, but rather ſeem to abhor it. The New-Zealand dogs, in all likelihood, are trained up from their earlieſt age to eat the remains of their maſter's meals; they are therefore uſed to feed upon fiſh, their own ſpecies, and perhaps human fleſh; and what was only owing to habit at firſt, may have become inſtinct by length of time. This was remarkable in our cannibal dog, for he came on board ſo young, that he could not have been weaned long enough to have acquired a habit of devouring his own ſpecies, and much leſs of eating human fleſh; however, one of our ſeamen having cut his finger, held it out to the dog, who fell to greedily, licked it, and then began to bite it.

From this account it appears that even the inſtincts of animals are not unchangable by natural cauſes; and if theſe cauſes are powerful enough to change the diſpoſition of ſucceeding generations, much more may we ſuppoſe them capable of making any poſſible alteration in the external appearance.

We are not here neceſſitated to confine ourſelves to obſervations made on brute animals. The Franks are an example of the production of one general character, formed by ſome natural cauſe from a mixture of many different nations. They were a motley multitude, conſiſting of various German nations dwelling beyond the Rhine: who, uniting in defence of their common liberties, took thence the name of *Franks*; the word *frank* ſignifying in their language, as it ſtill does in ours, *free*. Among them the following nations were mentioned, viz. the Actuarii, Chamavi, Bructeri, Salii, Friſii, Chauſi, Amſwarii, and Cheti. We cannot ſuppoſe one character to belong to ſo many different nations; yet it is certain, that, by living ſome time together, in a ſtate of a cloſe connection, they aſſumed a national character, which their deſcendants have, with very little variation, retained for a period of 1500 years. It is in vain, then, to talk of different races of men, either from their colour, ſize, or prevailing diſpoſitions, ſeeing we have undeniable proofs that all theſe may be changed, in the moſt remarkable manner, by natural cauſes, without any miraculous interpoſition of the Deity.

The next queſtion then, which preſents itſelf, is, From what part of the Old World, America has moſt probably been peopled?

This is a queſtion of great importance, and has given riſe to a variety of curious ſpeculations, the outlines of which we would here detail; but as we expect in a ſhort time, to be favored with ſome new inveſtigations of the ſubject, we ſhall poſtpone the farther conſideration of it, till we come to the article INDIANS, to which we refer our readers.

AMESBURY, a flouriſhing townſhip in Eſſex county, Maſſachuſetts, ſituated about four miles above Newburyport, on the N. W. bank of the river Merrimack, containing, nearly 2000 inhabitants. It is ſeparated from Saliſbury on the E. by the river Powaws, over which there is a handſome bridge. It is 40 miles N. by E. of Boſton, and nearly 400 miles to the eaſtward of Philadelphia.

AMETHYST, *n. s.* A precious ſtone of a violet colour, bordering on purple. The Amethyſt, among mineralogiſts, is more particularly deſcribed as a tranſparent gem of a purple colour, compoſed of a ſtrong blue and a deep red; and, according as either prevails, affording different tinges of purple, ſometimes approaching to violet, and ſometimes fading to a pale roſe colour. It is ſometimes found colourleſs, and may at any time be eaſily made ſo by putting it into the fire; in which pellucid or colourleſs ſtate, it ſo reſembles the diamond, that its want of hardneſs ſeems the only way of diſtinguiſhing it. The amethyſt is ſcarce inferior to any of the gems in the beauty of its colour; and in its pureſt ſtate is of the ſame hardneſs, and at leaſt of equal value with the ruby and ſapphire. It is found of various ſizes, from the bigneſs of a ſmall vetch, to an inch and an half in diameter, and often to much more than that in length. It is found in the Eaſt and Weſt Indies, and in ſeveral parts of Europe. Mr. Morin ſhewed Dr. Leiſter a large piece of French amethyſt, which weighed between 200 and 300lb! Mr. Ray ſpeaks of a mountain of amethyſts! But the oriental amethyſts are beſt, being, at leaſt ſome of the finer ſpecimens, ſo hard and bright as to equal any of the coloured gems in value.

AMETHYST, COUNTERFEIT OR FACTITIOUS. **Spars and cryſtals tinged red and yellow, &c. are ſold for amethyſts.** The falſe ones come from Germany, are tinged by vapours in the mines, and contain ſome lead. Amethyſts may be counterfeited by glaſs, to which the proper ſtain is given. There were fine ones made in France about the year 1690, which may even impoſe on connoiſſeurs, unleſs the ſtone be taken out of the collet.—The method of giving this colour to glaſs is as follows: Take cryſtal frit, made with the moſt perfect and fine tarſo: Then prepare a mixture of manganeſe in powder, one pound; and zaffer prepared, one ounce and a half: Mix theſe powders well together, and add to-every pound of the frit an ounce of this powder. Let it be put into the pot with the frit, not into the already made metal. When the whole has ſtood long enough in fuſion to be perfectly pure, work it into veſſels, and they will reſemble the colour of the Amethyſt.

AMETHYSTINE, *adj.* reſembling an amethyſt in colour.

AMEWELL, a populous townſhip of Hunterdon county, New-Jerſey, containing, according to the cenſus of 1790, 5201 inhabitants, of whom 283 were ſlaves. It is ſituated on the E. ſide of the Delaware, between Kingwood on the N. and Hopewell on the S. and is 34 miles N. by E. of Philadelphia.

AMHERST, a townſhip of Cumberland county, Nova Scotia, ſettled by adventurers, from the North of Ireland, Yorkſhire, and New-England. It is ſituated on Chignecto Baſon, on the S. ſide of La Planch River, and on the rivers Napan and Macon. The navigation of the two laſt is greatly impeded on account of ſhoals.

Amherst, a rich and populous county of Virginia, ſituated between the Blue Ridge and the Tide waters, containing 7407 free perſons, and 5296 ſlaves. A copper mine was once opened in this county, but either from bad management, or the poverty of the vein, it was diſcontinued.

Amherst, a port town of New-Hampſhire, and the capital of Hillſborough county, ſituated on a branch of Sowhegan river, which falls into the Merrimack. It was incorporated in 1762, and contains about 2400 inhabitants, a court-houſe, jail, and an academy, which was incorporated in 1790, by the name of the "Aurean Academy." It lies in Lat. 42. 53. N. and Long. 3. 47. E. being 53 miles N. W. from Boſton, and 384 from Philadelphia.

Amherst, a townſhip of Hampſhire county, Maſſachuſetts, 91 miles to the weſtward of Boſton, containing 1233 inhabitants.

AMIABLE, *adj.* 1. Lovely; pleaſing.—2. Pretending love; ſhewing love.

AMIABLENESS, *n. s.* the quality of being amiable; lovelineſs; power of raiſing love.

AMIABLY, *adv.* in an amiable manner; in ſuch a manner as to excite love.

AMIANTHUS, Earth-flax, or Salamander's hair, in natural hiſtory, a genus of foſſiles, of the claſs of the *fibrariæ:* It is a fibrous, flexile, elaſtic mineral ſubſtance, conſiſting of ſhort, abrupt, and interwoven filaments. It is found in Germany, in the ſtrata of iron ore, ſometimes forming veins of an inch diameter. Its fibres are ſo flexible that cloth has been made of them, and the ſhorter filaments that ſeparate in the waſhing of the ſtone, may be made into paper in the common manner. For the method of its preparation for manufacture into cloth. See Asbestos.

AMICABILITY, *n. s.* friendlineſs.

AMICABLE, *adj.* friendly; kind.

Amicable Numbers, ſuch as are mutually equal to the ſum of one another's aliquot parts. Thus the numbers 284 and 220 are amicable numbers: For the aliquot parts, 1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110, of 220, are together equal to the other number 284; and the aliquot parts 1, 2, 4, 71, 142, of 284, are together equal to 220.

AMICABLENESS, *n. s.* the quality of being amicable; good-will.

AMICABLY, *adv.* in an amicable manner; in a friendly way.

AMICE, *n. s.* the firſt or undermoſt part of the habit of a Catholic prieſt, over which he wears the alb.

AMID, or Amidst, *prep.* 1. In the midſt; equally diſtant from either extremity.—2. Mingled with; ſurrounded by; in the ambit of another thing.—3. Amongſt; conjoined with.

AMID ships, a ſea term, denoting the middle of the ſhip, either as to length or breadth.

AMIDST. See Amid.

AMIENS, a large and populous town of France, in the department of Somme, ſituated on the road from Calais to Paris, 20 miles S. E. of Abbeville, and 75 N. of Paris. It is agreeably ſituated on the river Somme, and is ſaid to have received its Latin name *Ambianum*, from being every where encompaſſed with water. It is a place of great antiquity; being mentioned by Cæſar, as a town that had made a vigorous reſiſtance againſt the Romans, and where he convened a general aſſembly of the Gauls, after having made himſelf maſter of it. The town is encompaſſed with a wall and other fortifications; and the ramparts are planted with trees, which form a delightful walk. The river Somme enters Amiens by three different channels, under as many bridges: and theſe channels, after waſhing the town in ſeveral places, where they are of uſe in its different manufactures, unite at the other end by the bridge of St. Michael. The houſes are well built; the ſtreets ſpacious, embelliſhed with handſome ſquares and good buildings; and the number of the inhabitants is about 45,000. The cathedral, dedicated to the Virgin Mary, is one of the largeſt, and moſt magnificent churches in France; adorned with handſome paintings, fine pillars, chapels, and tombs; particularly the nave is greatly admired. The other places worth ſeeing are the palace of the bailiwick, the town-houſe, the ſquare *des Fleurs*, and the great market place.—Amiens was taken by the Spaniards, in 1597, but retaken by Henry IV. who fortified it with a citadel. They have ſome woollen manufactures, and they alſo make a great quantity of black and green ſoap. This city may very probably become hereafter famous in hiſtory, as being the place at which a congreſs has met, compoſed of miniſters from the late belligerent powers in Europe; particularly France and England. But whether this meeting will terminate in the ratification of a definitive treaty of peace, or the recommencement of hoſtilities, we have as yet no certain information in this country. It will be noticed, however, under the article French Revolution, History of, which ſee. Long. 77. 30. E. Lat. 49. 54. N.

AMISS, *adv.* 1. Faultily; criminally.—2. Wrong; improper; unfit.—3. Impaired in health.

AMISSION, *n. s.* loſs.

To AMIT, *v. a.* to loſe: a word little in uſe.

AMITY, *n. s.* friendſhip.

AMMI, or Semen Ammeos, an aromatic ſeed. It is brought from the Levant, and contains a great deal of eſſential oil, and volatile ſalt. It is reckoned attenuating, aperitive, anti-hyſteric, alexipharmic, carminative, cephalic, and deobſtruent. It is alſo ſaid to reſiſt the bites of ſerpents.

AMMODYTES, sand eel, in ichthyology, a genus of fiſhes, belonging to the order of apodes. This fiſh reſembles an eel, and ſeldom exceeds a foot in length. The head of the ammodytes is compreſſed, and narrower than the body; the upper jaw is larger than the under; the body is cylindrical, with ſcales hardly perceptible. There is but one ſpecies, called the Ammodytes Tobianus, or the launce, a native of Europe. This fiſh gathers itſelf into a circle, and pierces the ſand with its head in the centre. It is found in ſandy ſhores, during ſome of the ſummer months: it conceals itſelf, on the receſs of the tides, beneath the ſand, in ſuch places where the water is left, at the depth of about a foot: and is in ſome places dug out, in others drawn up by means of a hook contrived for that purpoſe. They are commonly uſed as baits for other fiſh, but they are alſo very delicate eating. Theſe fiſh are found in the ſtomach of the porpus; an argument that the laſt roots up the ſand with its noſe, as hogs do the ground.

Ammodytes, in zoology, a ſpecies of ſerpent, by ſome called *ſerpens cornutus*, from ſome protuberances on its head. It is yellow or ſand coloured, and about the ſize of a viper. Its head reſembles that of a viper, but its jaws are wider; and in the upper part of the head, it has a wart-like excreſcence, reſembling a horn. It is found in Lybia, and ſome parts of Italy.

AMMONIAC, *n. s.* the name of a drug.

Ammoniac, Gum, a concrete, gummy, reſinous juice, brought from the Eaſt Indies, uſually in large maſſes, compoſed of little lumps or tears, of a milky colour, but ſoon changes, upon being expoſed to the air, to a yellowiſh hue. We have no certain account of the plant which affords this juice; the ſeeds uſually found among the tears reſemble thoſe of the umbelliferous claſs. It has been, however, alledged, and not without probability, that it is an exudation from a ſpecies of a plant, another ſpecies of which produces the aſafœtida. The plant producing it is ſaid to grow in Nubia, Abyſſinia, and the interior parts of Egypt. Such tears as are large, dry, free from little ſtones, ſeeds, or other impurities, ſhould be picked out, and preferred for internal uſe: the coarſer kind is purified by ſolution and colature, and then carefully inſpiſſating it; unleſs this be artfully managed, the gum will loſe a conſiderable deal of its more volatile parts. There is often vended in the ſhops, under the name of ſtrained gum ammoniacum, a compoſition of ingredients much inferior in virtue. Ammoniac has a nauſeous ſweet taſte, followed by a bitter one; and a peculiar ſmell, ſomewhat like that of galbanum, but more grateful: it ſoftens in the mouth, and grows of a whiter colour upon being chewed. Thrown upon live coals, it burns away in flame: it is in ſome meaſure ſoluble in water and in vinegar, with which it aſſumes the appearance of milk; but the reſinous part, amounting to about one half, ſubſides on ſtanding. Ammoniac is an uſeful deobſtruent, and frequently preſcribed for opening obſtructions of the abdominal viſcera, and in hyſterical diſorders occaſioned by a deficiency of the menſtrual evacuations. It is likewiſe ſuppoſed to deterge the pulmonary veſſels; and proves of conſiderable ſervice in ſome kinds of aſthmas, where the lungs are oppreſſed by viſcid phlegm: In this intention, a ſolution of gum ammoniac in vinegar of ſquills proves a medicine of great efficacy, though not a little unpleaſant. In long and obſtinate cholics proceeding from viſcid matter lodged in the inteſtines, this gummy reſin has produced happy effects, after the purges and the common carminatives had been uſed in vain. Ammaniac is moſt conveniently taken in the form of pills; about a ſcruple may be given every night, or oftener. Externally, it ſoftens, and ripens hard tumours: a ſolution of it in vinegar ſtands recommended by ſome for reſolving even ſchirrhous ſwellings. A plaſter made of it and ſquill vinegar is mentioned as being uſeful in white ſwellings. A diluted mixture of it is likewiſe rubbed on the parts, which are alſo fumigated with the ſmoke of juniper berries. In the ſhops is prepared a ſolution of it in penny-royal water, called from its milky colour, *lac ammoniaci*. It is an ingredient alſo in the ſquill pills.

Ammoniac, Sal, is a volatile ſalt of two kinds, ancient and modern. The ancient ſort, deſcribed by Pliny and Dioſcorides, was a native ſalt, generated in thoſe large inns where pilgrims, coming from the temple of Jupiter Ammon, uſed to lodge; who, travelling upon camels, and theſe creatures, urining in the ſtables: out of this urine, which is remarkably ſtrong, aroſe a kind of ſalt, denominated *Ammoniac*, and ſometimes from the country *Cyreniac*. The modern *ſal ammoniac* is entirely factitious and made in Egypt, with ſoot, a little ſea ſalt, and the urine of cattle. European chymiſts imitate the Egyptian *ſal ammoniac*, by adding one part of common ſalt to five of urine; with which ſome mix that quantity of ſoot, and putting the whole in a veſſel they raiſe from it, by ſublimation, a white, friable, farinaceous ſubſtance, which they call *ſal ammoniac*.

Ammoniac, Sal, compoſition of, &c. See Chemistry.

AMMONIACAL, *adj.* having the properties of ammoniac ſalt.

AMMUNITION, *n. s.* military ſtores, a general name for all warlike proviſions, but more eſpecially powder, ball, &c.

Ammunition Bread, *n. s.* bread for the ſupport of armies or garriſons.

AMNESTY, *n. s.* an act of oblivion.

AMNIOS, *n. s.* a thin pellucid membrane, which ſurrounds the fœtus in the womb. See Foetus.

AMOMUM, Ginger, a genus of the monogynia order, belonging to the monandria claſs of plants. Of this genus there are four ſpecies, viz. Cardamomum, or cardamom, Grana Paradiſi, Zerumbet, and Zingiber, or common ginger. Of theſe the three firſt are peculiar to the Eaſt Indies: the laſt ſpecies is a native of the Eaſt, and alſo of ſome parts of the Weſt Indies, where it grows naturally, without culture. The dried roots of ginger are of great uſe in the kitchen, as well as in medicine. The green roots, preſerved as a ſweet-meat, are preferable to every other kind. The Indians mix them with their rice, which is their common food, to correct its natural inſipidity. This ſpice, mixed with others, gives the diſhes ſeaſoned with it a ſtrong taſte, which is extremely diſagreeable to ſtrangers. Ginger is a very uſeful ſpice in cold flatulent cholics, and in laxity and debility of the inteſtines; it does not heat ſo much as thoſe of the pepper kind, but its effects are much more durable. In Jamaica, the common people employ it in baths and fomentations with good ſucceſs, in complaints of the viſcera, in pleuriſies, and in obſtinate and continued fevers.

AMONG,
AMONGST, } *prep.* 1. Mingled with. 2. Conjoined with others, ſo as to make part of the number.

AMORIST, *n. s.* an inamorato; a gallant; a man profeſſing love.

AMOROUS, *adj.* 1. Enamoured.—2. Naturally inclined to love.—3. Relating or belonging to love.

AMOROUSLY, *adv.* fondly; lovingly.

AMOROUSNESS, *n. s.* the quality of being amorous; fondneſs.

AMORPHA, FALSE INDIGO: A genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 37th order, Papilionaceæ. The characters are: The calyx is a ſingle-leaved perianthium, tubular and perſiſtent: The corolla conſiſts of an ovate, concave, erect petal, ſcarcely larger than, and placed on the upper ſide of, the calyx: The ſtamina conſiſt of ten erect unequal filaments, longer than the corolla; the antheriæ are ſimple: The piſtillum has a roundiſh germen; the ſtylus ſubulated, and the length of the ſtamina; the ſtigma ſimple: The pericarpium is a lunated unilocular legumen, reflected, larger than the calyx, and tuberculated: The ſeeds are two, and kidney ſhaped. By the corolla alone this genus may be diſtinguiſhed from all the known plants in the univerſe: The petals are the banner, the wings and keel are wanting; which is very ſingular in a papilionaceous corolla. Of this there is only one known ſpecies, a native of Carolina, where the inhabitants formerly made from it a coarſe kind of indigo, whence the plant took its name. It riſes, with many irregular ſtems, to the height of 12 or 14 feet. In order to make this tree have its beſt effect, it ſhould be planted among others of its own growth, in a well-ſheltered ſituation; by which means the ends will not be ſo liable to be deſtroyed by the winter's froſts; the branches will not ſuffer by the violence of the winds; and as it is ſubject to put out many branches near the root, theſe indelicacies and imperfections will be concealed; whilſt the tree will ſhow itſelf to the utmoſt advantage when in blow, by elevating its purple-ſpiked flowers amongſt the others in a pleaſing view.

AMORT, *adv.* in the ſtate of the dead; dejected.

AMORTIZATION, or AMORTIZEMENT, the alienation of lands or tenements to a corporation or fraternity and their ſucceſſors. See MORTMAIN.

To **AMORTIZE,** *v. a.* to alien lands or tenements to any corporation.

AMOVING, in law, the act of removing or expelling another from his place, office or the like.

AMOUNT, *n. s.* the ſum total; the reſult of ſeveral ſums or quantities accumulated.

To AMOUNT, *v. n.* to riſe to in the accumulative quantiy.

AMOUR, *n. s.* an affair of gallantry; an intrigue: generally uſed of vicious love.

AMPELIS. See GARRULUS.

AMPHIBIA, in zoology, the name of Linnæus's third claſs of animals; including all thoſe which live partly in water and partly on land.—This great author obſerves, that there have been fewer writers on this branch of natural hiſtory than any other; and that thoſe who have written on the ſubject, are not to be relied on. He mentions four; *Seba, Catesbæus, Gronovius* and *Garden;* and remarks that they are all deficient both in point of enumeration and deſcription. We ſhall not enter into a detail of all the animals which compoſe this claſs; as it would lead us far beyond the limits of our plan, but confine ourſelves to ſuch obſervations on thoſe of a peculiar nature, which we preſume will be found intereſting, curious and entertaining. It has been a queſtion whether the animals commonly called *amphibious*, live moſt in the water or on land. If we conſider the two Greek words, *amphi*, both ways, and *bios*, life, of which the term *amphibious* is compounded, we ſhould underſtand, that animals having this title, ſhould be capable of living as well by land, or in the air, as by water; or of dwelling in either conſtantly at will: but it will be difficult to find any animal that can fulfil this definition, as being equally qualified for either. An ingenious naturaliſt, therefore, from conſidering their economy reſpectively, treats them under two diſtinct heads, viz. 1. Such as enjoy their chief functions by land, but occaſionally go into water. 2. Such as chiefly inhabit the water, but occaſionally go aſhore. What he advances on this ſubject is curious, and will illuſtrate the nature of this claſs. 1. Of the firſt order, he particularly conſiders the phoca; and endeavours to ſhew, that none of them can live chiefly in the water, but that their chief enjoyment of the functions of life is on ſhore. Theſe animals he obſerves are really quadrupids. See PHOCA. But as their chief food is fiſh, they are under the neceſſity of going out to ſea to hunt their prey, and to great diſtances from ſhore; taking care that, however great the diſtance, rocks or ſmall iſlands are at hand, as reſting places when they are tired, or when their bodies become too much macerated in the water; and they return to the places of their uſual reſort to ſleep, copulate, and bring forth their young, for the following reaſons, viz. It is well known, that the only eſſential difference (as to the general ſtructure of the heart) between amphibious and mere land animals, or ſuch as never go into the water, is, that in the former the oval hole remains always open. Now, in ſuch as are without this hole, if they were to be immerſed in water for but a little time, reſpiration would ceaſe, and the animal muſt die; becauſe a great part of the maſs of blood paſſes from the heart by the pulmonary artery through the lungs, and by the pulmonary veins returns to the heart, while the aorta is carrying the greater part of the maſs to the head and extremities, &c. Now, the blood paſſes through the lungs in a continual uninterrupted ſtream, while reſpiration is gentle and moderate; but when it is violent, then the circulation is interrupted, for inſpiration and exſpiration are now carried to their extent; and in this ſtate the blood cannot paſs through the lungs either during the total inſpiration or total expiration of the air in breathing: for, in the former caſe, the inflation compreſſes the returning veins; and, in the latter, by the collapſion of the lungs, theſe veins are interrupted alſo; ſo that it is only between theſe two violent actions that the blood can paſs: and hence it is, that the lives of animals are ſhortened, and their health impaired, when they are ſubjected to frequent violent reſpiration; and thus it is, that when animals have once breathed, they muſt continue to reſpire ever after, for life is at an end when that ceaſes. There are three neceſſary and principal uſes of reſpiration in all land-animals, and in thoſe kinds that are counted amphibious. The firſt is that of promoting the circulation of the blood through the whole body and extremities. In real fiſhes, the force of the heart is alone capable of ſending the blood to every part, as they are not furniſhed with limbs or extremities; but in the others mentioned, being all furniſhed with extremities, reſpiration is an aſſiſtant force to the arteries, in ſending blood to the extremities, which, being ſo remote from the heart, have need of ſuch aſſiſtance, otherwiſe the circulation would be very languid in theſe parts: thus we ſee, that in perſons ſubject to aſthmatic complaints, the circulation grows languid, the legs grow cold and oedematous, and other parts ſuffer by the defect in reſpiration. A ſecond uſe of breathing is, that, in inſpiration, the variety of particles, of different qualities, which float always in the air, might be drawn into the lungs, to be inſinuated into the maſs of blood, being highly neceſſary to contemperate and cool the agitated maſs, and to contribute refined pabulum to the finer parts of it, which, meeting with the daily ſupply of chyle, ſerves to aſſimilate and more intimately mix the maſs, and render its conſtitution the fitter for ſupporting the life of the animal. Therefore it is, that valetudinarians, by changing foul or unwholeſome air for a free, good, open air, often recover from lingering diſeaſes. A third principal uſe of reſpiration is, to promote the exhibition of voice in animals; which all thoſe that live on the land do according to their ſpecific natures.

From theſe conſiderations it appears, that the phoca of every kind are under an abſolute neceſſity of making the land their principal reſidence. But there is another very convincing argument why they reſide on ſhore the greateſt part of their time; namely, that the fleſh of theſe creatures is analogous to that of other land animals; and therefore, by over long maceration added to the fatigue of their chacing their prey, they would ſuffer ſuch a relaxation as would deſtroy them. It is well known, that animals which have lain long under water, are reduced to a very lax and even putrid ſtate; and the phoca muſt baſk in the air on ſhore: for while the ſolids are at reſt, they acquire their former degree of tenſion, and the vigour of the animal is reſtored; and while he has an uninterrupted placid reſpiration, his blood is refreſhed by the new ſupply of air, as explained above, and he is rendered fit for his next cruiſe: for action waſtes the moſt exalted fluids of the body, more or leſs, according to its duration and violence; and the reſtorative reſt muſt continue a longer or ſhorter time, according to the quantity of the previous fatigue. Let us now examine by what power theſe animals are capable of remaining longer under water than land animals. All theſe have the oval hole open between the right and left auricles of the heart; and, in many, the canalis arterioſus alſo: and while the phoca remains under water, which he may continue an hour or two, more or leſs, his reſpiration is ſtopped; and the blood, not finding the paſſage through the pulmonary artery free, ruſhes through the hole from the right to the left auricle, and partly through the arterial canal, being a ſhort paſſage to the aorta, and thence to every part of the body, maintaining the circulation: but, upon riſing to come aſhore, the blood finds its paſſage again through the lungs the moment he reſpires. Thus the fœtus in utero, during its confinement, having the lungs compreſſed, and conſequently the pulmonary arteries and veins impervious, has the circulation of the blood carried on through the oval hole and the arterial canal. Now, ſo far the phoca in the water, and the fœtus in utero, are analogous; but they differ in other material circumſtances. One is, that the fœtus having never reſpired, remains ſufficiently nouriſhed by the maternal blood circulating through him, and continues to grow till the time of his birth, without any want of reſpiration during nine months confinement: the phoca, having reſpired the moment of his birth, cannot live very long without it, for the reaſons given before; and this hole and canal would be cloſed in them, as it is in land animals, if the dam did not, ſoon after the birth of the cub, carry him ſo very frequently into the water to teach him; by which practice theſe paſſages are kept open during life, otherwiſe they would not be capable of attaining the food deſigned for them by Providence. Another difference is, that the phoca, as was ſaid before, would be relaxed by maceration in remaining too long in the water; whereas the fœtus in utero ſuffers no injury from continuing its full number of months in the fluid it ſwims in: the reaſon is, that water is a powerful ſolvent, and penetrates the pores of the ſkins of land animals, and in time can diſſolve them; whereas the *liquor amnii* is an inſipid ſoft fluid, impregnated with particles more or leſs mucilaginous, and utterly incapable of making the leaſt alteration in the cutis of the fœtus. Otters, beavers, and ſome kinds of rats, go occaſionally into the water for their prey, but cannot remain very long under water. "I have often gone to ſhoot otters (ſays our author), and watched *all* their motions: I have ſeen one of them go ſoftly from a bank into the river, and dive down; and in about two minutes *riſe*, at 10 or 15 yards from the place he went in, with a middling ſalmon in his mouth, which he brought on ſhore; I ſhot him, and ſaved the fiſh whole." Now as all fœtuſes have theſe paſſages open, if a whelp of a true water-ſpaniel was immediately after its birth, ſerved as the phoca does her cubs, and immerſed in water, to ſtop reſpiration for a little time every day, it is probable that the hole and canal would be kept open, and the dog be made capable of remaining as long under water as the phoca. In the caſtor, or beaver, diſſected by the academiſts of Paris, though the foramen was not actually open, yet the marks of it appeared; and the cauſe of its cloſure might well enough be accounted for, from the animal's having been detained a good while from the water, by which the part having been in diſuſe cloſed up. In the otter the caſe is different; there is no appearance of any thing like a foramen, and hence the neceſſity the creature is under of riſing, from time to time, above water, to take in air. Phil. Tranſ. No. 124. This ſtructure of the feet of the caſtor pronounces it amphibious at firſt ſight, the fore-feet being formed like thoſe of terreſtrial animals, who hold their food in their feet *e. g.* ſquirrels, while the hind-feet are faſhioned after the manner of river fowl, with webs or membranes between the toes, as the gooſe, duck, &c. Frogs, how capable ſoever of remaining in the water, yet cannot avoid living on land, for they reſpire; and if a frog be thrown into a river, he makes to the ſhore as faſt as he can. See the article Rana.—The lizard kind, ſuch as may be called water-lizards, (ſee Lacerta,) are all obliged to come to land, in order to depoſit their eggs, to reſt, and to ſleep. Even the crocodiles, who dwell much in rivers, ſleep and lay their eggs on ſhore; and, while in the water, are compelled to riſe to the ſurface to breathe; yet, from the texture of his ſcaly covering he is capable of remaining in the water longer by far than any ſpecies of the phoca, whoſe ſkin is analogous to that of a horſe or cow.—The hippopotamus, who wades into the lakes or rivers, is a quadruped, and remains under water a conſiderable time; yet his chief reſidence is upon land, and he muſt come on ſhore for reſpiration.—The teſtudo, or ſea tortoiſe (ſee Testudo), though he goes out to ſea and is often found far from land; yet, being a reſpiring animal, cannot remain long under water. He has indeed a power of rendering himſelf ſpecifically heavier or lighter than the water, and therefore can let himſelf down to avoid an enemy or a ſtorm: yet he is under a neceſſity of riſing frequently to breathe, for reaſons given before; and his moſt uſual ſituation, while at ſea, is upon the ſurface of the water, feeding upon the various ſubſtances that float in great abundance every where about him. Theſe animals ſleep ſecurely upon the ſurface, but not under water, and can remain longer at ſea than any other of this claſs, except the crocodile, becauſe, as it is with the latter, his covering is not in danger of being too much macerated: yet they muſt go on ſhore to copulate and lay their eggs. 2. The conſideration of theſe is ſufficient to inform us of the nature of the firſt order of the claſs of amphibious animals; let us now ſee what is to be ſaid of the ſecond order in our diviſion of them, which are ſuch as chiefly inhabit the waters, but occaſionally go on ſhore.—Theſe are but of two kinds: the eels, and water ſerpents or ſnakes of every kind. It is their form that qualifies them for loco-motion on land, and they know their way back to the water at will; for by their ſtructure they have a ſtrong periſtaltic motion, by which they can go forward at a pretty good rate (ſee the Articles Serpent and Muræna), whereas all other kinds of fiſh, whether vertical or horizontal, are incapable of a voluntary loco-motion on ſhore; and therefore, as ſoon as ſuch fiſh are brought out of the water, after having flounced a while, they lie motionleſs, and ſoon die. Let us now examine into the reaſon why theſe vermicular fiſh, the eel and ſerpent kinds, can live a conſiderable time on land, and the vertical and horizontal kinds die almoſt immediately when taken out of the water: and in this reſearch, we ſhall come to know what analogy there is between land-animals and thoſe of the waters. All land-animals have lungs, and can live no longer than while theſe are inflated with the ambient air, and alternately compreſſed for its expulſion; that is, while reſpiration is duly carried on, by a regular inſpiration and exſpiration of air. In like manner, the fiſh in general have, inſtead of lungs, gills or bronchiæ; and as in land-animals the lungs have a large portion of the maſs of blood circulating through them, which muſt be ſtopped if the air has not a free ingreſs and egreſs into and from them; ſo, in fiſh, there is a great number of blood-veſſels that paſs through the bronchiæ, and a great portion of their blood circulates through them, which muſt in like manner be totally ſtopped, if the bronchiæ are not perpetually wet with water. So that, as the air is to the lungs in land-animals a conſtant aſſiſtant to the circulation; ſo is the water to the bronchiæ of thoſe of the rivers and ſea: for when theſe are out of the water, the bronchiæ very ſoon grow criſp and dry, the blood-veſſels are ſhrunk, and the blood is obſtructed in its paſſage; ſo, when the former are immerſed in water, or otherwiſe prevented from having reſpiration, the circulation ceaſes, and the animal dies. Again, as land-animals would be deſtroyed by too much maceration in water; ſo fiſhes would, on the other hand, be ruined by too much exſiccation; the latter being, from their general ſtructure and conſtitution, made fit to bear, and live in, the water; the former, by their conſtitution and form, to breathe and dwell in the air. But it may be aſked, why eels and water-ſnakes are capable of living longer in the air than the other kinds of fiſh? This is anſwered by conſidering the providential care of the great Creator for theſe and every one of his creatures: for ſince they were capable of loco-motion by their form, which they need not be if they were never to go on ſhore; it ſeemed neceſſary that they ſhould be rendered capable of living a conſiderable time on ſhore, otherwiſe their loco-motion would be in vain. How is this provided for? Why, in a moſt convenient manner: for this order of fiſhes have their bronchiæ well covered from the external drying air; they are alſo furniſhed with a ſlimy mucous, which hinders their becoming criſp and dry for many hours: and their very ſkins always emit a mucous liquor, which keeps them ſupple and moiſt for a long time: whereas the bronchiæ of other kinds of fiſh are much expoſed to the air, and want the ſlimy matter to keep them moiſt. Now, if any of theſe, when brought out of the water, were laid in a veſſel without water, they might be preſerved alive a conſiderable time, by only keeping the gills and ſurface of the ſkin conſtantly wet, even without any water to ſwim in. A great part of the fly-kind may be ſaid, in one ſenſe, to be amphibious. Gnats drop their eggs in water, where hatching, the young live and breathe after the manner of fiſhes, till at length undergoing a metamorphoſis, they take wing, quit their native element, and become inhabitants of the air. In theſe, as in many other inſtances, we ſee how wonderfully is the ſtructure of every part of the creation to ſubſerve the grand deſigns of the Creator, and to diſplay his omnipotence and benevolence, throughout all his works. It has been advanced that man may, by art, be rendered amphibious, and able to live under water as well as frogs. As the fœtus lives *in utero* without air, and the circulation is there continued by means of the foramen ovale; by preſerving the paſſage open, and the other parts *in statu quo*, after the birth, the ſame faculty would ſtill continue. Now, the foramen, it is alledged, would be preſerved in its open ſtate, were people accuſtomed, from their infancy, to hold their breath a conſiderable time once a-day, that the blood might be forced to reſume its priſtine paſſage, and prevent its drying up as it uſually does. This conjecture ſeems, in ſome meaſure, ſupported by the practice of divers who are taught from their childhood to hold their breath, and keep long under water, by which means the ancient channel is kept open. A Calabrian monk at Madrid laid claim to this amphibious capacity, making an offer to the king of Spain, to continue twice twenty-four hours under water, without ever coming up to take breath. Kircher gives an account of a Sicilian, named the *Fiſh Colas*, who by a long habitude from his youth, had ſo accuſtomed himſelf to live in water, that his nature ſeemed to be quite altered; ſo that he lived rather after the manner of a fiſh than a man.

Claſsification according to Linnæus.

The claſſical characters of the Amphibia or Amphibious animals, are the following. They have the heart furniſhed with one ventricle and one auricle, their blood is cold and red, and they reſpire voluntarily.

This claſs is divided into three orders, viz. Reptiles, Serpentes, and Nantes.

Order I. *Reptiles.* The reptiles have legs and breathe by the mouth. This order contains four genera, viz. Teſtudo, Draco, Lacerta and Rana. See theſe Articles.

Order II. *Serpentes.* The ſerpentes have no legs, and breathe by the mouth. This order contains ſix genera, viz. Crotalus, Boa, Coluber, Anguis, Amphiſbæna and Cæcilia. See theſe Articles.

Order III. *Nantes.* The Nantes are furniſhed with lungs, and at the ſame time breathe by lateral gills, and the rays of their fins are cartilaginous. This order contains fourteen genera, viz. Petromyzon, Raja, Squalus, Chimæra, Lophius, Acipenſer, Cyclopterus, Baliſtes, Oſtracion, Tetrodon, Diodon, Centriſcus, Syngnaſus, and Pegaſus. See theſe Articles.

Here it is neceſſary to obſerve, that the order Nantes was introduced in the Syſtem of Ichthyology, firſt compiled by Artedi, a Swediſh Naturaliſt of great eminence, and fellow ſtudent with Linnæus, who on the deceaſe of his friend, reviſed and publiſhed his Syſtem in Latin. But Linnæus, though, in all his former editions of the Syſtema Naturæ, he adopted the method of Artedi, with little variation; in the latter edition has removed the Cetaceous order into the claſs Mammalia, and the order Nantes into the claſs Amphibia.

To theſe three Orders ſome naturaliſts add a fourth, which they call Meantes. The Meantes have both lungs and gills, and the feet are furniſhed with toes and claws. This order has but one genus, viz. the Siren.

The generic characters of this claſs are taken from the general figure of the body; from their having tails or no tails; being covered with a ſhell; having teeth or no teeth in the mouth; being furniſhed with wings, having covered or naked bodies; from the number, ſituation and figure of the ſcuta and ſcales; from the number and ſituation of the ſpiracula, from the ſituation of the mouth, &c.

The deſcriptions of the ſeveral genera are given in the order of the alphabet. The ſpecific characters are ſo very various, that it would be ſuperfluous to enumerate them.

From this ſummary view of this claſs of the animal kingdom, called Amphibia, for the cauſes heretofore aſſigned, we ſee, as in numberleſs other inſtances in the boundleſs extent of Natural Hiſtory, how wonderfully the ſtructure and economy of every part of the creation is adapted to ſubſerve the deſigns of the Almighty Creator, and to diſplay his omnipotence and benevolence throughout all his works; ſo that nothing can afford more ſublime enjoyment to a contemplative mind, than, according to the language of the author of the Eſſay on Man,

> " To look thro' Nature up to Nature's God."

AMPHIBIOLOGY, *n. s.* the hiſtory of amphibious animals.

AMPHIBIOUS, *adj.* that which partakes of two natures, ſo as to live in two elements; as, in air and water.

AMPHISBÆNA, in zoology, a genus of ſerpents belonging to the order of amphibia ſerpentes, ſo called becauſe it moves with either end foremoſt, which occaſioned the notion of its having two heads. The head is ſmall, ſmooth, and blunt; the noſtrils are very ſmall; the eyes are minute and blackiſh; and the mouth is furniſhed with a great number of ſmall teeth. The body is cylindrical, about a foot long, and divided into about 200 annular convex ſegments like thoſe of a worm; and it has about 40 longitudinal ſtreaks, of which 12 on each ſide are in the form of ſmall croſſes like the Roman X; the anus is a tranſverſe ſlit; and the laſt ring or ſegment of the belly has 8 ſmall papillæ, forming a tranſverſe line before the anus; the tail, *i. e.* all the ſpace below the anus, is ſhort, conſiſting of 30 annular ſegments, without being marked with the croſs-lines, and is thick and blunt at the point. The colour of the whole animal is black, variegated with white; but the black prevails moſt on the back, and the white on the belly. It has a great reſemblance to a worm, living in the earth, and moving equally well with either end foremoſt. There are but two ſpecies, viz.

1. AMPHISBÆNA ALBA, which is totally white, is a native of both the Indies, and is generally found in ant hillocks. The bite of the amphiſbæna is reckoned mortal by many authors; but, as it is not furniſhed with dog-fangs, the uſual inſtruments of conveying the poiſon of ſerpents, later writers eſteem it not to be poiſonous. They feed upon ants and earth-worms, but particularly the latter.

2. AMPHISBÆNA FULIGINOSA, which anſwers exactly to the deſcription of the genus, and is found in Lybya and in different parts of America.

AMPHISCII, *n. s.* in geography, a term applied to the inhabitants of the torrid zone, who have their ſhadows ſouth, when the ſun is towards the north; and north, when the ſun is ſouth. They are, likewiſe, called ASCII, which ſee.

AMPHITHEATRE, *n. s.* in antiquity, a building in a circular or oval form, having its area encompaſſed with rows of ſeats one above another, upon which the people uſed to behold the combats of gladiators, wild beaſts, and other exhibitions. There are amphitheatres ſtill ſtanding at Rome, at Pola, at Niſmes, &c. The amphitheatre of Veſpaſian, called the *Coliſeum*, and that of Verona in Italy, are the moſt celebrated now remaining of all antiquity. Remains of amphitheatres are ſhown alſo at Arles, Bourdeaux, &c. The amphitheatre at Pola, an ancient republic of Iſtria, is very entire: it conſiſts of two orders of Tuſcan pillars, one over the other. The lower have pedeſtals, which is extraordinary; this order having ſcarce ever more than baſes to ſupport them. The amphitheatre of Veſpaſian is computed to have been capable of holding 87,000 ſpectators. That of Verona is the beſt preſerved: for though moſt of the great and beſt ſtones of the outſide are picked out, yet the great vault, on which the rows of the ſeats are laid, is entire. Every row is a foot and a half high, and as much in breadth; ſo that a man ſits conveniently in them, and allowing for a ſeat a foot and a half, the whole will hold 23,000 perſons.

AMPLE, *adj.* 1. Large; wide; extended.—2. Great in bulk.—3. Unlimited; without reſtriction.—4. Liberal; large; without parſimony.—5. Magnificent; ſplendid.—6. Diffuſive; not contracted.

AMPLENESS, *n. s.* largeneſs.

AMPLIATION, *n. s.* 1. Enlargement; exaggeration; extenſion.—2. Diffuſeneſs; enlargement.

To **AMPLIFICATE**, *v. a.* to enlarge; to amplify.

AMPLIFICATION, *n. s.* 1. Enlargement; extenſion. 2. It is uſually taken in a rhetorical ſenſe and implies exaggerated repreſentation, or diffuſe narrative; an image heightened beyond reality; a narrative enlarged with many circumſtances. Amplification may, likewiſe, be defined to be that part of a diſcourſe or ſpeech wherein a crime is aggravated, a praiſe or commendation heightened, or a narration enlarged, by an enumeration of circumſtances; ſo as to excite the proper emotions in the ſouls of the auditors. The maſters of eloquence make amplification to be the ſoul of diſcourſe.

AMPLIFIER, *n. s.* one who enlarges any thing; one who exaggerates.

To **AMPLIFY**, *v. a.* 1. To enlarge.—2. To exaggerate any thing.—3. To improve by new additions.

To Amplify, *v. n.* 1. To lay one's ſelf out in diſcuſſion. 2. To form large or pompous repreſentations.

AMPLITUDE, *n. s.* 1. Extent.—2. Largeneſs; greatneſs.—3. Capacity; extent of intellectual faculties.—4. Splendour; grandeur.—5. Copiouſneſs; abundance.

Amplitude, in aſtronomy, an arch of the horizon intercepted between the eaſt and weſt point and the centre of the ſun, or a planet, at its riſing or ſetting; and ſo is either north or ſouth, or ortive and occaſive. See Astronomy.

Amplitude, Magnetical, the different riſing or ſetting of the ſun from the eaſt or weſt points of the compaſs. It is found by obſerving the ſun at his riſing and ſetting, by an amplitude compaſs. See Navigation.

AMPLY, *adv.* 1. Largely; liberally.—2. At large; without reſerve.—3. At large; copiouſly; with a diffuſive detail.

To **AMPUTATE**, *v. a.* to cut off a limb: a word uſed only in chirurgery.

AMPUTATION, *n. s.* the operation of cutting off a limb, or other part of the body. See Surgery.

AMSTERDAM, the capital of the Batavian Republic, is ſituated on the river Amſtel, at the conflux with the river Ye or Wye, about two leagues from the Zuyder ſea. It takes its name from Amſtel and dam, being, as it were, the dam or dyke of the Zuyder ſea. In the beginning of the 13th century, it was only the reſidence of a few fiſhermen, but it is now one of the greateſt trading towns in Europe, though from the ſhallowneſs of the Pampus, the only paſſage leading to it, out of the Zuyder ſea, it might be thought but indifferently ſituated for commerce, as ſhips of burden muſt be lightened in order to paſs through it, and afterwards muſt wait for an eaſterly or north-eaſt wind to go through the Marſdiep into the North-Sea; yet the harbour being one of the largeſt and ſafeſt in Europe, counterbalances theſe diſadvantages. The ground, on which the city ſtands is naturally marſhy, and the buildings founded on oaken piles, which occaſioned the facetious Eraſmus to ſay, that in this country vaſt numbers of people lived on the tops of trees. The middle of the town is interſected by a great number of navigable canals, which, while they conduce to the cleanlineſs and pleaſantneſs of the place, are, at the ſame time, a great convenience to trade; but in hot weather they emit a fœtid effluvia, which would be ſtill worſe, were not the water kept in continual motion, by the working of two large water-mills, and one mill turned by horſes. All the canals iſſue into the Wye, and the Amſtel, and ſuch as go far up into the town, being interſected by croſs canals, have a communication with each other. Theſe canals divide the town into a multitude of iſlands, joined together by bridges, ſome of which are of ſtone, and others of wood. The city forms a ſemicircle on the Wye and is fortified on the land ſide with ramparts, and 26 regular baſtions; and, on that ſide, the neighbouring country may be laid under water. On the ſide next the Wye, it is ſecured by a double row of piles driven into the river, projecting ſome feet above the ſurface; but, in ſome places, openings are left for ſhips to paſs in and out, and in the night theſe openings are fenced with a boom. The piles extend in length no leſs than 50,000 feet, and without them, in a place called the Laag, lie the large ſhips in ſuch numbers, that their maſts reſemble a foreſt, and in the intermediate ſpaces between the town and the inner row of piles, are ranged innumerable ſmall ſhips and barks. The Stadthouſe is eſteemed one of the fineſt ſtructures in the univerſe. It is 282 feet in front, 232 feet deep and 116 feet high, excluſive of the cupola. It coſt 300,000 pounds ſterling, or $ 1,332,000, at a time when money was more valuable than it is now. The great hall of this building is peculiarly magnificent. Under the Stadthouſe is an extenſive vault, wherein are kept the riches of the bank of Amſterdam, the doors of which are ſaid to be cannon-proof. At the bottom of the Stadthouſe are the priſon both for criminals and debtors; and the guard-room for the citizens, where the keys of the city are locked up every night. At the end of the great hall is the chamber, where civil cauſes are tried; beſides theſe are the burgomaſters' chamber, the chamber of accounts, &c. In the ſecond ſtory is a large magazine of arms, and on the top of the building are ſix large ciſterns conſtantly filled with water, which by means of pipes, can be conveyed into any room of the houſe, in caſe of fire, to prevent which, the chimneys are lined with copper. This immenſe fabric, the foundation of which was laid in 1648, like the reſt of the city, is built on piles, 14,000 being employed for that purpoſe only. The bourſe or exchange is of freeſtone and built in the year 1615 on 2,000 piles. Its length is 200 feet and its breadth 124; the galleries are ſupported by 26 marble pillars, on each of which are the names of the people who are to meet there: they are all numbered, and there is a place fixed for every merchandize under ſome one of their numbers: on the right ſide of the gate is a ſuperb ſtair-caſe, which leads to the galleries, on one ſide of which there are ſeveral ſhops, and on the other a place to ſell clothes. This building is not unlike the Royal Exchange, London. The Academy, or as it is called, the *Illuſtrious School*, is a very fine building, in which are taught the Latin, and Oriental languages, theology, philoſophy, hiſtory, law, phyſic, &c. This city is ſuppoſed to contain 250,000 inhabitants compoſed of almoſt every people and nation in Europe, who were all tolerated in their religious perſuaſions, but, however it may be ſince the late revolution, none, previous to that period, had any ſhare in the government, except Calviniſts. There are eleven churches for the Dutch of the Calviniſtical or eſtab-

liſhed religion, with two French and one High Dutch.—The Engliſh have alſo three churches in this city, one for the Preſbyterians, one for the church of England, and one for the Browniſts. There are, likewiſe, one church of Armenians or Remonſtrants, two of Lutherans, and three of Mennoniſts; but the Catholics have a greater number of places of worſhip, than all the above mentioned ſects put together, their number amounting to no leſs than 27. None, however, but the Calviniſts were allowed to have bells, and their miniſters were maintained at the public expence, whilſt thoſe of other perſuaſions had to maintain their own clergy. The Jews, who are very conſiderable in this place, have two ſynagogues, one of which, namely, the Portugueſe, is the largeſt in Europe. Within the court yard, where their ſynagogue ſtands, they have ſeveral ſchools, where their children are taught Hebrew, and very carefully inſtructed in the Jewiſh Religion. The fineſt amongſt the other religious buildings is the new church, dedicated to St. Catharine. The pulpit is a maſter-piece of the kind, where the four evangeliſts and many other curious pieces of ſculpture, are repreſented. The glaſs windows are, likewiſe, adorned with various remarkable paintings, among which the emperor Maximilian is deſcribed preſenting an imperial crown to the burgomaſters of Amſterdam for the creſt of the arms of this city. The organ is very large, and reckoned one of the beſt in the world. It has a ſet of pipes which counterfeit a chorus of voices, and has 52 whole ſtops, beſides half ſtops, with two rows of keys for the feet, and three for the hands. The grates which divide the chancel from the body of the church, is of Corinthian braſs, and the branches of the candleſticks are the richeſt in Batavia. There are, likewiſe, in Amſterdam, a number of hoſpitals, or houſes for orphans, poor widows, ſick people, and for the inſane, all of which are under the moſt excellent regulations. There are alſo ſome houſes of correction, as the Raſp Houſe, where felons raſp Brazil wood for a certain number of years, or for life, according to the nature of their crimes. When they are incorrigible, and too lazy to work, they are often put up for an hour or two in a dungeon, where water comes in, ſo that they muſt be continually labouring at the pump, in order to avoid being drowned. There are here Spin houſes, where proſtitutes and other women of bad character are compelled, in ſome degree, to atone, by ſpinning &c. for the immoralities of which they have been guilty. All theſe foundations, and the good police of the city have ſuch an effect, that there are no beggars in the ſtreets. Here are officers, who take up all vagabonds, and convey them directly to houſes provided for that purpoſe, where they are forced to work, every man in his own buſineſs, in proportion to his ſtrength and ability. Here the poor, who want work and offer themſelves are received. Theſe hoſpitals are ſupported partly by voluntary contributions, put into the poor's boxes, fitted up in various parts of the city, and partly by a tax on all public diverſions. Every perſon who paſſes through any of the gates at candle light, pays a penny for the ſame uſe. In Amſterdam and moſt of the conſiderable cities in Holland there is a public office, where all poor travellers, who can give any account of themſelves, may go, and take a loaf of bread, a penny and a paſſport, by virtue of which they are received gratis into the boats, which carry goods and paſſengers from one town to anothe
ment of this city, like that of all the others
formerly highly ariſtocrotic, being compoſ
council, called Vroedſchap, conſiſting of th
who enjoyed their places for life, and when
the remainder choſe another in his ſtead.
late revolution, the people are without
to ſome ſhare in the government. The ci
contributed to the public expences abov
livres per day, beſides the exciſe of beer,
which, in the whole, amounted to $7,104,
of Amſterdam is prodigious: for almoſt t
the Eaſt-India company centres in this ci
carries on a very extenſive commerce with
the Mediterranean, Norway, the countri
tic, &c. inſomuch that it may be called
ſtore houſe of Europe.

A diſpute having exiſted for ſome yea
patriots of Holland, and the Prince of
tempted to extend his prerogatives, the pat
to gain the aſcendancy, in conſequence of
of Pruſſia, the brother-in-law of that Prin
againſt them, under the command of the
wick, who arrived before Amſterdam an
patriots to ſurrender on the 1ſt of October,
of a refuſal, threatened to bombard the ci
divided amongſt themſelves, and unprepare
reſiſtance againſt ſo powerful an army, ope
the Pruſſians, and were obliged to ſubmit
to the Stadtholder. The exultation of
ever, was but of ſhort continuance; for t
having overrun Holland, made a triump
Amſterdam, the 19th of January, 1795, an
with open arms by the inhabitants. The
his family fled to England, a great revoluti
and the ſtates aſſumed the name of the
PUBLIC, which ſee. It is 65 miles N. o
E. by N. of London, and 240 N. by E.
52, 23. N. Long. 79. 50. E.

Amſterdam, an iſland in the Frozen
harbour of Smeerenber, on the coaſt of Sp
Dutch, in order to promote their whale fiſ
ago attempted to eſtabliſh a ſettlement on
which purpoſe they left ſome people to win
the return of the veſſels, the next ſumme
periſhed. Lat. 79. 44. N. Long. 85. 3.

Amſterdam, an iſland in the South Se
been diſcovered by Taſman, a Dutch navi
viſited by Captain Cook in his late voyage
extent from E. to W. is about 21 miles, an
about 13. It is broad at the E. end, and t
the W. where it turns, and runs to a poin
about ſix leagues W. of Middleburg. T
rounded by a coral rock, and its moſt ele
not above ſix or eight yards above the l
Long. 99. 33. W. Lat. 21. 11. S. It is w
plantations, in which are cultivated ſome
productions of nature: ſuch as bread fruit, c
plantains, bananas, ſhaddocks, yams, and ot
canes, and a fruit like a nectarine, called
fighege. There is not an inch of waſte gro

occupy no more ſpace than is abſolutely neceſſary: the fences do not take up above four inches each; and even theſe are not wholly loſt, for in many grow ſome uſeful trees or plants: nature, aſſiſted by a little art, no where appears with more ſplendor than on this iſland. Water is not ſo plentiful here as at the Society Iſlands; but the chief pointed out to Capt. Cook a pool of freſh water, unaſked, to ſupply the ſhips with that neceſſary article. Caſuarinas, pandangs, and wild ſago palms, appear here with their various tints of green, and barringtoniæ as big as the loftieſt oaks. The bread fruit does not, however, thrive here with the ſame luxuriance as at the Society Iſlands; the coral rock, which compoſes the baſis of this ſpot, being much more thinly covered with mould.—Both men and women are of the common ſize of Europeans, and their colour is that of a lightiſh copper; they are well ſhaped, have regular features, are active, briſk, and lively. They have fine eyes, and in general good teeth, even to an advanced age. The women are the merrieſt creatures imaginable, and inceſſant talkers. In general, they appear to be modeſt; although there is no want of thoſe of a different ſtamp. Among the natives who ſwam about the ſhip very vociferouſly, were a conſiderable number of women, who wantoned in the water like amphibious creatures, and were eaſily perſuaded to come on board perfectly naked; none of them, however, ventured to ſtay there after ſunſet, but returned to the ſhore to paſs the night, like the greater part of the inhabitants, under the ſhade of the wild wood which lined the coaſt. There they lighted great fires, and were heard converſing almoſt the whole night. The hair of both ſexes in general is black, but eſpecially that of the women; both ſexes wear it ſhort, except a ſingle lock on the top of the head, and a ſmall quantity on each ſide. The men cut or ſhave their beards quite cloſe, which operation they perform with two ſhells. The dreſs of both ſexes conſiſts of a piece of cloth or matting wrapped round the waiſt, and hanging down below the knees. From the waiſt upwards they are generally naked, and it ſeems to be a cuſtom to anoint theſe parts every morning. The practice of *tattowing*, or puncturing the ſkin, likewiſe prevails. The men are tattowed from the middle of the thigh to above the hips; the women have it totally on their arms and fingers, and on thoſe parts but very ſlightly. Their ornaments are amulets, necklaces, and bracelets, the bone, ſhells, and beads of mother-of-pearl, tortoſe-ſhell, &c. which are worn by men as well as women. They make the ſame kind of cloth, and of the ſame materials, as at Otaheitee, though they have not ſuch a variety, nor do they make any ſo fine; but as they have a method of glazing it, it is more durable, and will reſiſt rain for ſome time, which the other cloth would not. Their colours are black, brown, yellow, purple, and red; all made from vegetables. They alſo make ſeveral kinds of domeſtic utenſils.—Notwithſtanding their friendly diſpoſition, theſe people have very formidable weapons; ſome of their ſpears have many barbs, and muſt be very dangerous weapons when they take effect. A large flat ſhell or breaſtplate was purchaſed, made of a roundiſh bone, white and poliſhed like ivory, about 18 inches in diameter, which appeared to have belonged to an animal of the whale tribe.

Amsterdam, New, the name, given by the Dutch to the city now called New-York, ſo long as they kept poſſeſſion of it.

AMULET, *n. s.* a thing hung about the neck, or any other part of the body, for preventing or curing of ſome particular diſeaſes Amulets in the days of ſuperſtition, were much eſteemed as charms, or preſervatives againſt miſchief, witchcraft, and diſeaſes. They were made of ſtone, metals, vegetables, animals, and in a word every thing that imagination ſuggeſted. Sometimes they conſiſted of words, characters, and ſentences, ranged in a particular order, and engraved upon wood, &c. and worn about the neck, or ſome other part of the body. See Abracadabra. At other times they were neither written nor engraved; but prepared with many ſuperſtitious ceremonies, great regard being uſually paid to the influence of the ſtars. The Arabians have given to this ſpecies of amulet the name of talisman. All nations have been fond of amulets: the Jews were extremely ſuperſtitious in the uſe of them, to drive away diſeaſes; and the Miſna forbids them, unleſs received from an *approved* man, who had cured at leaſt three perſons before by the ſame means! Among the Chriſtians of the early ages, amulets were made of the wood of the croſs, or ribbands with a text of ſcripture written in them, as a preſervative againſt diſeaſes; Notwithſtanding the progreſs of learning and refinement, there is not perhaps a nation in the world, even at this day, where ignorant and ſuperſtitious people do not place confidence in ſome charm or other, although they are now greatly fallen from that repute in which they were held formerly.

AMURCOSITY, *n. s.* the quality of lees or mother of any thing.

AMUSEMENT, *n. s.* that which amuſes; entertainment.

To **AMUSE**, *v. a.* 1. To entertain with tranquillity.—2. To draw on from time to time; to keep in expectation.

AMUSER, *n. s.* one who amuſes.

AMUSIVE, *adj.* that which has the power of amuſing.

AMYGDALATE, *adj.* made of almonds.

Amagalate, *n. s.* in pharmacy, an artificial milk or emulſion, made of almonds.

AMYGDALINE, *adj.* relating to almonds; reſembling almonds.

AMYGDALUS, the Almond and Peach: a genus of the monogynia order, belonging to the icoſandria claſs of plants; and, in the natural method, ranking under the 36th order, Pomaceæ. The characters are: The calyx is a ſingle leaved perianthium beneath, tubular, and quinquefid: The corolla conſiſts of five oblong petals, which are inſerted into the calyx: The ſtamina conſiſt of 30 ſlender erect filaments, half the length of the corolla, and inſerted into the calyx; the antheriæ are ſimple: The piſtillum has a round villous germen above; a ſimple ſtylus, the length of the ſtamina; and the ſtigma headed: The pericarpium is a large roundiſh villous drupa, with a longitudinal furrow: The ſeed is an ovate compreſſed not perforated in the pores. There are:

Amygdalus communis, or Common Almond, a native of Africa, grows to near 20 feet high; and whether planted ſingly in an open place, or mixed with others in clumps, ſhrubbery quarters, &c. ſhows itſelf one of the fineſt flowering trees in nature. Thoſe who never yet ſaw it, may eaſily conceive what a noble appearance this tree muſt make, when covered all over with a bloom of a delicate red, in March; a time when very few trees are ornamented either with leaves or flowers. Neither are the beauties of the flowers the only thing deſirable in this tree: The fruit would render it worthy of planting, were there no other motive. It ripens well, and its goodneſs is not unknown to us. The white flowering almond, is a variety of this ſpecies, and is cultivated for the ſake of the flowers and the fruit, though the flowers are inferior to the others.

Amygdalus nana, the **dwarf almond**, is a native of Aſia minor. Of this ſhrub there are two varieties, the ſingle and the double. Both grow to about four or five feet high, and are in the firſt eſteem as flowering ſhrubs. The ſingle ſort has its beauties; but the double kind is matchleſs. In both the flowers are arranged the whole length of the laſt year's ſhoots; their colour is a delicate red; and they ſhow themſelves early in the ſpring, which ſtill enhances their value.

Amygdalus persica, or the Peach, is ſaid to be a native of Europe; but of what place is not known It is now exceedingly common in the United States; and is to be met with in very great varieties: but as we are not, at preſent in poſſeſſion of any information concerning it, except what is to be found in the Britiſh Encyclopædia, we muſt refer our readers to the article Peach, where we ſhall lay before them, the beſt deſcription we can poſſibly obtain, and alſo an account of the moſt approved method of cultivating the different ſpecies of this truly valuable fruit-tree. The Amygdalus Nuci-Perſica, or the Nectarine, which according to Linnæus is only a variety of the peach, will be found under the ſame article.

Amygdalus, uses of the, in medicine, &c. Sweet almonds are reckoned to afford little nouriſhment; and, when eaten in ſubſtance, are not eaſy of digeſtion, unleſs thoroughly comminuted: Peeled, and eaten ſix or eight at a time, they ſometimes give preſent relief in the heartburn.—But in medicine, they are moſtly uſed for making emulſions; and they abound not only with an oil, but likewiſe with a mucilage fit for incorporating oil and water together. Emulſions are commonly prepared from almonds, by beating an ounce of them, after being blanched, into a fine pulp, in a marble or ſtone mortar; and triturating them well, with half an ounce (more or leſs) of fine ſugar; and then adding by little at a time, a quart of water; taking care to continue grinding them while the water is poured on; after which the white milky liquor is ſtrained through a cloth, and put into a quart bottle. Some people add a dram of blanched bitter almonds to an ounce of the ſweet, which they think make the emulſions more agreeable. Such emulſions have been much uſed as drink in acute diſeaſes, for diluting and blunting acrimonious juices in the firſt paſſages, and acrid ſaline particles in the blood; and for ſoftening and lubricating the fibres and membranes. It has been a common practice to diſſolve from half an ounce to an ounce, or more, of gum arabic in the water uſed for making the emulſions; and to make patients drink freely of them, while bliſters are applied to the body, in order to prevent ſtranguary; and to order them to be uſed in caſes of gravel, and of inflammation of the bladder or urethra; and in heat of urine from virulent gonorrhœa or other cauſes. Camphor, reſin of jalap, and other reſinous ſubſtances, by being triturated with almonds, become miſcible with water, and more mild and pleaſant than they were before: and therefore they are frequently ordered to be rubbed with them, and made up into pills or boluſes, with the addition of ſome conſerve or gum arabic mucilage; or they are incorporated with watery liquors into the form of an emulſion. Formerly the ſeeds of the lettuce, of the cucumber, of the white poppy, and of a number of other plants, were employed for making emulſions; but now generally the ſweet almonds ſupply the place of all the reſt. The bitter almonds are not ſo much uſed as they were formerly; becauſe they have been found to deſtroy ſome ſorts of animals: this effect was related by the ancients, but believed to be fictitious; becauſe, when eaten by men, they appear to be innocent, and to produce no deleterious effects. However, the facts related by Wepfer, in his treatiſe *de Cicuta Aquatica*, having been confirmed by later experiments: and it having been diſcovered, that a water drawn from them had deleterious effects, and that diſtilled water from the leaves of the lauro-ceraſus, which have a bitter taſte, reſembling that of bitter almonds, was ſtill more poiſonous; it raiſed a ſuſpicion of the wholeſomeneſs of thoſe bitter ſubſtances, and has made phyſicians more cautious of uſing them, though they have been employed for making orgeate and other liquors, without producing any bad effects.

AN, *art.* the indefinite article, uſed before a vowel, or *h* mute. See A. 1. One, but with leſs emphaſis.—2. Any, or ſome.

ANA, *adv.* a word uſed in the preſcriptions of phyſic, importing the like quantity; as, wine and honey, *a* or *ana* ℥ ii; that is, of wine and honey each two ounces.

ANABAPTISTS, i. e. *Re-baptisers*, a name given, by ſome in deriſion, and by others in miſtake, to a certain claſs of Chriſtians, becauſe, not holding to infant baptiſm as valid, or indeed as *any* baptiſm at all, they baptiſe thoſe, who join them, though according to the uſual way of ſpeaking, they had been baptiſed in their infancy. This reſpectable body of Chriſtians give themſelves the name of Baptists, under which head, ſee a correct ſtatement of their opinions, &c.

ANACARDIUM, or **cashew-nut tree**: a genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 12th order, Holoraceæ. The characters are: The calyx is divided into five parts, the diviſions ovate and deciduous: The corolla conſiſts of five reflected petals, twice the length of the calyx: The ſtamina conſiſts of 10 capillary filaments ſhorter than the calyx, one of them caſtrated; the antheræ are ſmall and roundiſh: The piſtillum has a roundiſh germen; the ſtylus is ſubulated, inflected, and the length of the corolla; the ſtigma oblique; There is no pericardium; the receptaculum is very large and fleſhy: The ſeed is a large kidney-ſhaped nut, placed above the receptaculum. Only one ſpecies is known, viz.

Anacardium occidentale. It grows naturally in the Weſt-Indies, and arrives at the height of 20 feet.—The fruit of this tree is as large as an orange; and is full of an acid juice, which is frequently made uſe of in making punch. To the apex of this fruit grows a nut, of the ſize and ſhape of a hare's kidne[illegible] but it is much larger at the end which is next to the fruit than at the other. The ſhell is very hard; and the kernel, which is ſweet and pleaſant, is covered with a thin film. Between this and the ſhell is lodged a thick blackiſh, inflammable liquor, of ſuch a cauſtic nature in the freſh nuts, that if the lips happen to touch it, bliſters will immediately follow. The kernels are eaten raw, roaſted, or pickled. The cauſtic liquor juſt mentioned is eſteemed an excellent coſmetic with the Weſt-India young ladies, but they muſt certainly ſuffer a great deal of pain in its application. When any of them fancy themſelves too much tanned by the ſcorching rays of the ſun, they gently ſcrape off the outſide of the ſtone, and then rub their faces all over with the ſtone. Their faces immediately ſwell and grow black; and the ſkin being poiſoned by the cauſtic oil above mentioned, will, in the ſpace of five or ſix days, come off in large flakes, ſo that they cannot appear in public in leſs than a fortnight; by which time the new ſkin looks as fair as that of a new born child. The negroes in Brazil cure themſelves effectually of diſorders in the ſtomach, by eating of the yellow fruit of the tree; the juice of which, being acid, cuts the thick tough humours which obſtruct the free circulation of the blood, and thus removes the complaint. This cure, however, is not voluntary: For their maſters, the Portugueſe, deny them any other ſuſtenance; and letting them looſe into the woods, where the caſhew nuts grow in great abundance, leave it in their option to periſh by famine, or ſuſtain themſelves with this fruit. The milky juice of this tree will ſtain linen of a good black, which cannot be waſhed out.

ANACHORETE, } *n. s.* (frequently written *anchorite.*)
ANACHORITE, } A monk, who leaves the convent for a more recluſe life.

ANACREONTIC, in the Greek and Latin poetry, ſomething invented by Anacreon, or in the manner and taſte of Anacreon, a poet of Teios, who lived upwards of 400 years before Chriſt, famous for the delicacy of his wit, and the exquiſite, yet eaſy and natural, turn of his poeſy. We have ſeveral of his odes ſtill extant; and there are few of the modern poets who have not written Anacreontics in imitation of them. They are moſtly compoſed in verſes of ſeven ſyllables: or rather of three feet and a half; ſpondees and iambics, though ſometimes anapæſts. Hence, verſes, in that meaſure, are ſometimes called *Anacreontics*, or *Anacreontic verſes.*

The verſes of Anacreon are ſweeter, ſays Scaliger, than Indian ſugar. His beauty and chief excellence, ſays Madam Dacier, lay in imitating nature, and in following reaſon; ſo that he preſented to the mind no images but what were noble and natural. The odes of Anacreon, ſays Rapin, are flowers, beauties, and perpetual graces; it is familiar to him to write what is natural and to the life, he having an air ſo delicate, ſo eaſy, and graceful, that among all the ancients there is nothing comparable to the method he took, nor to that kind of writing he followed. He flows ſoft and eaſy, every where diffuſing the joy and indolence of his mind through his verſe, and tuning his harp to the ſmooth and pleaſant temper of his ſoul. But none has given a juſter character of his writings than the God of love, as taught to ſpeak by Mr. Cowley:—

All thy verſe is ſofter far
Than the downy feathers are
Of my wings, or of my arrows,
Of my mother's doves and ſparrows:
Graceful, cleanly, ſmooth, or round,
All with Venus' girdle bound.

ANADIPLOSIS, *n. s.* reduplication; a figure in rhetoric, in which the laſt word of a foregoing member of a period becomes the firſt of the following; as, *He retained his virtues amidſt all his* miſfortunes, miſfortunes *which only his virtues* brought upon him.

ANAGOGICAL, *adj.* myſterious; elevated; religiouſly exalted.

ANAGOGICALLY, *adv.* myſteriouſly; with religious elevation.

ANAGRAM, *n. s.* a conceit ariſing from the letters of a name tranſpoſed; as this, of *W,i,l,l,i,a,m, N,o,y,* attorney-general to Charles I. a very laborious man, *I moyl in law.*

ANAGRAMMATISM, *n. s.* the act or practice of making anagrams.

ANAGRAMMATIST, *n. s.* a maker of anagrams.

To ANAGRAMMATIZE, *v. n.* to make anagrams.

ANALEMMA, in geometry, a projection of the ſphere on the plane of the meridian, orthographically made by ſtraight lines and ellipſes, the eye being ſuppoſed at an infinite diſtance, and in the eaſt or weſt points of the horizon. Analemma denotes likewiſe an inſtrument of braſs or wood, upon which this kind of projection is drawn, with a horizon and curſor fitted to it, wherein the ſolſtitial colure, and all circles parallel to it, will be concentric circles; all circles oblique to the eye, will be ellipſes; and all circles whoſe planes paſs through the eye, will be right lines. The uſe of this inſtrument is to ſhow the common aſtronomical problems; which it will do, though not very exactly, unleſs it be very large.

ANALEPTIC, *adj.* comforting; corroborating: a term of phyſic.

ANALOGAL, *adj.* analogous; having relation.

ANALOGICAL, *adj.* 1. Uſed by way of analogy.—2. Analogous; having reſemblance or relation.

ANALOGICALLY, *adv.* in an analogical manner; in an analogous manner.

ANALOGISM, *n. s.* an argument from the cauſe to the effect.

To ANALOGIZE, *v. a.* to explain by way of analogy.

ANALOGOUS, *adj.* having analogy; having ſomething parallel.

ANALOGY, *n. s.* 1. Reſemblance between things with regard to ſome circumſtances or effects.—2. By grammarians, it is uſed to ſignify the agreement of ſeveral words in one common mode; as, from *love* is formed *loved*, from *hate*, *hated*, from *grieve*, *grieved.*

Analogy, in philoſophy, a certain relation and agreement between two or more things, which in other reſpects are entirely different. There is likewiſe an analogy between things that have ſome conformity or reſemblance to one another; for example, between animals and plants; but the analogy is ſtill ſtronger between two different ſpecies of certain animals. Analogy enters much into all our reaſoning, and ſerves to explain and illuſtrate. A great part of our philoſophy, indeed, has no other foundation than analogy. It is natural to mankind to judge of things leſs known, by ſome ſimilitude, real or imaginary, between them.

them and things more familiar or better known. And where the things compared have really a great ſimilitude in their nature, when there is reaſon to think that they are ſubject to the ſame laws, there may be a conſiderable degree of probability in concluſions drawn from analogy. Thus we may obſerve a very great ſimilitude between this earth which we inhabit, and the other planets, Saturn, Jupiter, Mars, Venus, and Mercury. They all revolve round the ſun as the earth does, although at different diſtances, and in different periods. Several of them are known to revolve round their axis like the earth, and, by that means, muſt have a like ſucceſſion of day and night. Some of them have moons, that ſerve to give them light in the abſence of the ſun, as our moon does to us. They are all, in their motions, ſubject to the law of gravitation as the earth is. From all this ſimilitude, it is not unreaſonable to think, that thoſe planets may, like our earth, be the habitation of various orders of living creatures. There is ſome probability in this concluſion from analogy. But it ought to be obſerved, that, as this kind of reaſoning can afford only probable evidence at beſt; ſo, unleſs great caution be uſed, we are apt to be led into error by it. To give an inſtance of this: Anatomiſts, in ancient ages, ſeldom diſſected human bodies, but very often the bodies of thoſe quadrupeds whoſe internal ſtructure was thought to approach neareſt to that of the human body. Modern anatomiſts have diſcovered many miſtakes the ancients were led into, by their conceiving a greater ſimilitude between the ſtructure of men and of ſome beaſts than there is in reality. Perhaps no author has made a more juſt and a more happy uſe of this mode of reaſoning, than biſhop Butler, in his analogy of Religion, Natural and Revealed, to the Conſtitution and Courſe of Nature. In that excellent work, the author does not ground any of the truths of religion upon analogy, as their proper evidence. He only makes uſe of analogy to anſwer objections againſt them. When objections are made againſt the truths of religion, which may be made with equal ſtrength againſt what we know to be true in the courſe of nature, ſuch objections can have no weight. Analogical reaſoning, therefore, may be of excellent uſe in anſwering objections againſt truths which have other evidence. It may likewiſe give a greater or leſs degree of probability in caſes where we can find no other evidence. But all arguments drawn from analogy are ſtill the weaker, the greater diſparity there is between the things compared; and therefore muſt be weakeſt of all when we compare body with mind, becauſe there are no two things in nature more unlike. There is no ſubject in which men have always been ſo prone to form their notions by analogies of this kind, as in what relates to the mind. We form an early acquaintance with material things by means of our ſenſes, and are bred up in a conſtant familiarity with them. Hence we are apt to meaſure all things by them; and to aſcribe to things moſt remote from matter, the qualities that belong to material things. It is for this reaſon that mankind have, in all ages, been ſo prone to conceive the mind itſelf to be ſome ſubtile kind of matter: That they have been diſpoſed to aſcribe human figure, and human organs, not only to angels, but even to the Deity. The derivation of the word Analogy indicates, as profeſſor Caſtillon, of Berlin, obſerves, a reſemblance diſcernible by reaſon. This is confirmed by the ſenſe in which the term is uſed in geometry, where it ſignifies an equality of ratios. In explaining this ſubject, it is obſerved, there may be a reſemblance between ſenſations and a reſemblance between perceptions: the former is called *phyſical reſemblance*, becauſe it acts upon the phyſical or ſenſitive faculty; the latter *moral reſemblance*, becauſe it affects the moral or rational faculty of man. Every phyſical reſemblance may be reduced to one or more equalities; and every moral reſemblance to one or more identities. Wherever there is moral reſemblance there is analogy. Analogy may therefore be reduced to identity and always ſuppoſes compariſon. Two objects are ſaid to have an analogy to each other or are called *analogous*, when ſome identity is diſcovered upon comparing them. An *analogical concluſon*, is a concluſion deduced from ſome identity.—The principles of analogy are a compariſon of two objects; and one or more identities reſulting from their being thus compared. The characters of analogy are—that two objects be compared—that there be one or more identities between theſe objects; and that this is diſcernable only by reaſon or intellect. *Phyſical reſemblance* is to the ſenſes what *analogy* is to the underſtanding. The former, when perfect, becomes equality; but the latter, identity. Reſemblance and analogy are the foundations both of probability and of certainty. When we are not ſatisfied that the reſemblance or the analogy is complete, we ſtop at probability; which becomes certainty when we are, or think we are, aſſured that the reſemblance or analogy is perfect. In reaſoning by analogy, we ſhould be careful not to confound it with reſemblance; and alſo not to deduce from the identity or identities, on which the analogy is founded, a concluſion, which has either no relation, or only a partial relation, to theſe identities. The principal uſe of analogy in the inveſtigation of phyſical and moral truth, according to our author, may be reduced to the four following: 1. By means of our ſenſes to improve, firſt our own judgment, and afterwards that of others, with reſpect to intellectual ſubjects. 2. To deduce a general from a particular truth. Having diſcovered and proved the truth of a propoſition with reſpect to any particular object, examine whether this truth flows from a quality peculiar to this ſingle object, or common to ſeveral objects. In the latter caſe all theſe objects may be comprehended under one general idea, founded on their common quality. Subſtitute this general idea inſtead of the particular object, and the propoſition will become general, without ceaſing to be true; becauſe whatever evidently and ſolely reſults from the identity, on which an analogy is founded, muſt neceſſarily be true with reſpect to all thoſe objects in which the analogy is the ſame. 3. To prove the truth or falſehood of propoſitions which cannot be otherwiſe demonſtrated. 4. To diſcover new truths in both natural and moral philoſophy. The analogy between the three kingdoms, of plants, animals, and minerals, has been the ſource of a variety of diſcoveries, either real or imaginary: hence it is we have learnt, that plants breathe: that the ſap circulates in them; that generation is performed by eggs in the human kind; that the planets have their atmoſpheres, their inhabitants, their trees, their ſeas, &c. Indeed, if we will follow whither analogy, real or imaginary, will lead us, there is no end of ſcience. As to divine and ſupernatural matters, it is aſſerted we know nothing of them.

them, but by analogy; that is, by the mediation and ſubſtitution of thoſe ideas we have of ourſelves and other natural beings. Our ideas of God himſelf ariſe from this ſpring; we have no direct and immediate perception of him. The knowledge we have of the Supreme Being, is only an obſervation of his works, and a reflection of the mind, which ſhews what power, wiſdom, &c. appear neceſſary to enable him to produce them. Having no proper ideas of his perfections, we give them the names of thoſe faculties of men, which we judge neceſſary. See an excellent treatiſe on the Analogy of Religion, natural and revealed, to the Conſtitution and Courſe of Nature, by biſhop Butler, (as before-mentioned) in which, by evincing the analogy or likeneſs that ſubſiſts between the ſyſtem of things and diſpenſation of providence, which revelation informs us of, and that ſyſtem of things and diſpenſation of providence which experience and reaſon inform us of, *i. e.* the known courſe of nature, he is led to aſcribe both to the ſame author and cauſe.

ANALYSIS *n. s.* 1. A ſeparation of a compound body into the ſeveral parts of which it conſiſts.—2. A conſideration of any thing in parts.—3. A ſolution of any thing, whether corporeal or mental, to its firſt elemets.

Analysis, in chemiſtry, is uſed for the decompounding of a mixed body, or the ſeparation of the principles and conſtituent parts of compounded ſubſtances. To analyze bodies, or reſolve them into their component parts, is indeed the chief object of the art of chemiſtry. Chemiſtry furniſhes ſeveral means for the decompoſition of bodies, which are all founded on the difference of the properties belonging to the different principles of which the body to be analized is compoſed. If, for example, a body compoſed of ſeveral principles, ſome of which have a great, and others a moderate degree of volatility, and, laſtly, others are fixed, its moſt volatile parts may be firſt ſeparated by a gradual heat in diſtilling veſſels; and then the parts which are next in volatility will paſs over in diſtillation; and laſtly, thoſe parts which are fixed, and capable of reſiſting the action of fire, will remain at the bottom of the veſſel.

Analysis, in literature, is alſo uſed for a kind of ſyllabus, or table of the principal heads or ſections of a continued diſcourſe, diſpoſed in their natural order and dependency. Analyſes are more ſcientifical than alphabetical indexes; but they are leſs uſed, as being more intricate. Analyſis is likewiſe uſed for a brief, but methodical, illuſtration of the principles of a ſcience; in which ſenſe it is nearly ſynonimous with what we otherwiſe call a *synopsis*.

Analysis, in logic, ſignifies the method of tracing things backward to their ſource, and of reſolving knowledge into its original principles. This is alſo called the method of *reſolution*; and ſtands oppoſed to the ſynthetic method, or that of *compoſition*.—The art of logical analyſiſts conſiſts principally in combining our perceptions, claſſing them together with addreſs, and contriving proper expreſſions for conveying our thoughts, and repreſenting their ſeveral diviſions, claſſes, and relations.

Analysis, in mathematics, is properly the method of reſolving problems by means of algebraical equations; whence we often find that theſe two words *analyſis* and *algebra*, are uſed as ſynonymous. Analyſis, under its preſent improvements, muſt be allowed the apex or height of all human learning: It is this method which furniſhes us with the moſt perfect examples of the art of reaſoning; gives the mind an uncommon readineſs at deducing and diſcovering, from a few data, things unknown; and, by uſing ſigns for ideas, preſents things to the imagination, which otherwiſe ſeemed out of its ſphere: By this, geometrical demonſtrations may be greatly abridged, and a long ſeries of argumentations, wherein the mind cannot without its utmoſt effort and attention, diſcover the connection of ideas, are hereby converted into ſenſible ſigns, and the ſeveral operations required therein effected by the combination of thoſe ſigns. But, what is more extraordinary, by means of this art, a number of truths are frequently expreſſed by a ſingle line, which, in the common way of explaining and demonſtrating things, would fill whole volumes. Thus, by mere contemplation of one ſingle line, whole ſciences may be ſometimes learnt in a few minutes time, which otherwiſe could ſcarce be attained in many years. Analyſis is divided, with regard to its object, into that of *finites and infinites*.

1. Analysis of finite quantities, is what we otherwiſe call ſpecious arithmetic, or algebra. See Algebra.

2. Analysis of finites, called alſo the New Analysis, is particularly uſed for the method of fluxions, or the differential calculus. See Fluxions.

Analysis, in rhetoric, is that which examines the connections, tropes, figures, and the like, enquiring into the propoſition, diviſion, paſſions, arguments, and other apparatus of rhetoric. Several authors, as Freigius and others, have given analyſes of Cicero's orations, wherein they reduce them to their grammatical and logical principles; ſtrip them of all the ornaments and additions of rhetoric, which otherwiſe diſguiſe their true form, and conceal the connection between one part and another. The deſign of theſe authors is to have thoſe admired harangues juſt ſuch as the judgment diſpoſed them, without the help of imagination; ſo that here we may coolly wiew the force of each proof, and admire the uſe Cicero made of rhetorical figures to conceal the weak part of a cauſe. A collection has been made of the analyſes formed by the moſt celebrated authors of the 16th century, in three vols. folio.

ANALYTIC, or Analytical, *adj.* ſomething that belongs to, or partakes of, the nature of analyſis.—Thus we ſay, an analytical demonſtration, analytical proceſs, analytical table or ſcheme, analytical method of inveſtigation, &c.

ANALYTICALLY, *adv.* in ſuch a manner as ſeparates compounds into ſimples.

ANALYTICK, *adj.* the manner of reſolving compounds into the ſimple conſtituent or component, applied chiefly to mental operations.—The analytic method, in logic, ſtands oppoſed to the ſynthetic. In natural philoſophy, as in mathematics, the inveſtigation of difficult things by the analytic method, ought to precede the method of compoſition. This analyſis conſiſts in making experiments and obſervations, and in drawing general concluſions therefrom by induction; and admitting of no objections againſt the concluſions, but ſuch as are drawn from experiments, and other certain truths: and though the reaſoning from experiments and obſervations by induction be no demonſtration of general concluſions, yet it is the beſt method of reaſoning which the nature of things admit of; and may be eſteemed ſo much the ſtronger, as the induction is more general; and, if no exception occur from phenomena, the concluſion may be pronounced general. By this way of analyſis, we may proceed from compounds to their ingredients; from motions to the forces producing them; and in general from effects to their cauſes, and from particular cauſes to more general ones, until we arrive at thoſe which are the moſt general. This is the analytic method, according to the illuſtrious Newton. The ſynthetic method conſiſts in aſſuming the cauſes diſcovered and received as principles, and by them explaining the phenomena proceeding from them, and proving the explanations. See SYNTHESIS.

To ANALYZE, *v. a.* to reſolve a compound into its firſt principles. See ANALYSIS.

ANALYZER, *n. s.* that which has the power of analyzing.

ANAMORPHOSIS, *n. s.* deformation; perſpective projection, ſo that at one point of view, it ſhall appear deformed; in another, an exact and regular repreſentation.

ANAPÆST, in ancient poetry, a foot conſiſting of two ſhort ſyllables and one long: Such is the word *ănĭmōs*. It is juſt the reverſe of the dactyl.

ANARCH, *n. s.* an author of confuſion.

ANARCHICAL, *adj.* confuſed; without rule or government.

ANARCHY, *n. s.* want of government; a ſtate without magiſtracy.

ANARRHICAS LUPUS, or ſea wolf; which ſeems to be confined to the northern parts of the globe. It is a moſt ravenous and fierce fiſh, and, its bite is ſaid to be ſo hard, that it will ſeize on an anchor, and leave the marks of its teeth in it. It feeds almoſt entirely on cruſtaceous animals and ſhell fiſh, ſuch as crabs, lobſters, prawns, muſcles, ſcollops, &c. theſe it grinds to pieces with its teeth, and ſwallows with the leſſer ſhells. It does not appear they are diſſolved in the ſtomach, but are voided with the feces; for which purpoſe, the aperture of the anus is wider than in other fiſh of the ſame ſize. The ſea wolf grows to a large ſize: ſome of them having been taken near Shetland ſeven feet long, and even more. The head is a little flatted on the top; the noſe blunt; and the noſtrils are very ſmall; the eyes ſmall, and placed near the end of the noſe; and the teeth remarkably adapted to its way of life. The appearance of this fiſh is ſo extremely diſagreeable, that few except the fiſhermen can think of eating it; but theſe prefer it even to the halibut.

ANAS, in ornithology, a genus of birds belonging to the order of anſeres. The beak of this genus is a little obtuſe, covered with an epidermis or ſkin, gibbous at the baſe and broad at the apex: the tongue is obtuſe and fleſhy; the feet are webbed and fit for ſwimming. The ſpecies are extremely numerous; of which the following are the principal, viz.

1. The cygnus, of which there are two varieties, viz. the ferus and manſuetus. The ferus, with a ſemicylindrical black bill, yellow wax, and a white body, is the whiſtling or wild ſwan of Engliſh authors, and is leſs than the tame or mute ſpecies, being about five feet in length. Theſe birds inhabit the northern world as high as Iceland, and as low as the ſoft climate of Greece or of Lydia, the modern Anatolia, in Aſia Minor: it even deſcends as low as Egypt. They ſwarm, during ſummer, in the great lakes and marſhes of the Tartarian and Siberian deſerts; and reſort in great numbers to winter about the Caſpian and Euxine ſeas. Thoſe of the eaſtern parts of Siberia retire beyond Kamtſchatka, either to the coaſts of America, or to the iſles north of Japan. In Siberia they ſpread far north, but not to the Arctic circle. They arrive in Hudſon's Bay about the end of May, where they breed in great numbers on the ſhores, in the iſlands, and in the inland lakes; but all retire to the ſouthern parts of North-America in autumn, even as low as Carolina and Louiſiana. In Carolina they are ſaid to be of two ſorts; the larger, called from its note the Trumpeter, arrive in great flocks to the freſh rivers in winter, and in February retire to the great lakes to breed: the leſſer are called Hoopers, and frequent moſtly the ſalt water. The Indians of Louiſiana wear the ſkins, with the downs attached to them, ſewed together by way of covering; and of the larger feathers they make diadems for their chiefs, as well as weave the ſmaller on threads, as barbers do for their wigs, with which they cover garments, that are worn only by women of the higheſt rank. In Auguſt theſe birds loſe their feathers, and are not able to fly: when the natives of Iceland and Kamtſchatka hunt them with dogs, which catch them by the neck, and eaſily ſecure their prey. In the laſt place they are alſo killed with clubs. The eggs are accounted good food; and the fleſh, eſpecially that of the young, is much eſteemed by the inhabitants. The wild ſwan frequents the Britiſh coaſts in hard winters in large flocks, but does not breed there; we are likewiſe told, that ſwans come in October in great numbers to Lingey, one of the Weſtern Iſles; and continue there till March, when they return northward to breed. A few continue in Mainland, one of the Orkneys, and breed in the little iſles of the freſh-water lochs; but the multitude retire at the approach of ſpring. On that account, ſwans are there, the poor man's almanack: on their quitting the iſle, they preſage good weather; on their arrival, they announce bad. Theſe, as well as moſt other water-fowl, prefer, for the purpoſe of incubation, thoſe places that are leaſt frequented by mankind: accordingly we find that the lakes and foreſts of the diſtant Lapland are filled during ſummer with myriads of water-fowl; and there ſwans, geeſe, the duck-tribe, gooſanders, divers, &c. paſs that ſeaſon; but in autumn return to Britain, and to other more hoſpitable ſhores. This ſpecies has ſeveral diſtinctions from the ſpecies which is commonly called the *tame ſwan*. In Ruſſia this ſpecies more fitly claims the name, it being the kind moſt commonly tamed in that empire. The whiſtling ſwan carries its neck quite erect, the other ſwims with it arched. This is far inferior in ſize. It has twelve ribs on a ſide, the mute only eleven. But the moſt remarkable is the ſtrange figure of the windpipe; which falls into the cheſt, then turns back like a trumpet, and afterwards makes a ſecond bend to join the lungs. Thus it is enabled to utter a loud and ſhrill note. The other ſwan, on the contrary is the moſt ſilent of birds: it can do nothing more than hiſs, which it does on receiving any provocation. The vocal kind emits its loud notes on-

ly when flying or calling. Its ſound is, *whoogh, whoogh*, very loud and ſhrill, but not diſagreeable, when heard far above one's head and modulated by the winds. The natives of Iceland compare it to the notes of a violin. In fact, they hear it, (ſays Mr. Pennant) at the end of their long and gloomy winter, when the return of the ſwans announces the return of ſummer; every note muſt be therefore melodious which preſages the ſpeedy thaw, and the releaſe from their tedious confinement. It is from this ſpecies alone that the ancients have given the fable of the ſwan being endued with the powers of melody. Embracing the Pythagorean doctrine, they made the body of this bird the manſion of the ſouls of departed poets; and after that, attributed to the birds the ſame faculty of harmony which their inmates poſſeſſed in a pre-exiſtent ſtate.

The Manſuetus, or mute ſwan, is a bird of conſiderable ſize. It is diſtinguiſhed externally from the wild ſwan; firſt, by its ſize being much larger; ſecondly, by its bill, which in this is red, and the tip and ſides black, and the ſkin between the eyes and bill is of the ſame colour. Over the baſe of the upper mandible, projects a black callous knob: the whole plumage, in old birds is white; in young ones, aſh-coloured, till the ſecond year: the legs are duſky; but Dr. Plott mentions a variety found on the river Trent, in England, with red legs. The ſwan is held in high veneration by the Mahometans. It is a very ſtrong bird, and ſometimes exceeding fierce, as it has frequently been known to throw down and trample under feet youths of 13 or 14 years of age. It is ſaid to be very long lived, and frequently to arrive at the hundredth year. The young are not perfect in plumage till the ſecond year. The ſwan lays the firſt egg in February, and continues laying every other day to the amount of ſix, ſeven, or eight eggs; theſe it places on a bed of graſs near the water, and ſits ſix weeks. It feeds on both fiſh and herbage. No bird, perhaps, makes ſo inelegant a figure out of the water, or has command of ſuch beautiful attitudes on that element, as the ſwan: almoſt every poet has taken notice of it; but none with that juſtneſs of deſcription, and in ſo pictureſque a manner, as Milton:

> The ſwan with arched neck
> Between her white wings mantling, proudly rows,
> Her ſtate with oary feet. *Par. Loſt.* B. vii.

The anſer, *ferus manſuetus*; or grey lag, and tame gooſe. The *grey lag*, or *wild gooſe*, is two feet nine inches in length, and five feet in extent. The bill is large and elevated; of a fleſh colour, tinged with yellow; the head and neck cinerous; breaſt and belly whitiſh, clouded with grey or aſh colour; back, grey; the legs of a fleſh colour. This ſpecies reſides in the fens the whole year; breeds there, and hatches about eight or nine young, which are often taken, eaſily tamed, and by ſome eſteemed ſuperior meat to the domeſtic gooſe. Towards winter they collect in great flocks, but in all ſeaſons live and feed in the fens. They are migratory, changing place in large flocks, often 500 or more: in this caſe, the flock is triangular in ſhape, with one point foremoſt; and as the gooſe which is firſt is tired ſooneſt, it has been ſeen to drop behind, and another to take his place. In very ſmall flocks, however, they are ſometimes ſeen to follow one another in a direct line. The *manſuetus* is the grey lag in a ſtate of domeſtication, and from which it varies in colour. Tame geeſe are kept in great multitudes in the fens of Lincolnſhire, in England: a ſingle perſon will have 1000 old geeſe, each of which will rear ſeven; ſo that towards the end of the ſeaſon he will become poſſeſſed of 8000. During the breeding ſeaſon theſe birds are lodged in the ſame houſes with the inhabitants, and even in their very bed chambers: in every apartment are three rows of coarſe wicker pens, placed one above another; each bird has its ſeparate lodge divided from the other, which it keeps poſſeſſion of during the time of ſetting. A perſon called a *gozzard*, i. e. *gooſe herd*, attends the flock, and twice a-day drives the whole to water; then brings them back to their neſts, without ever miſplacing a ſingle bird. The geeſe are plucked five times in the year: the firſt plucking is at about the end of March, for feathers and quills; and the ſame is renewed, for feathers only, fonr times more between that and the firſt of October. The old geeſe ſubmit quietly the operation, but the young ones are very noiſy and unruly. If the ſeaſon proves cold, number of them die by this barbarous cuſtom. It is ſaid to be very long lived, as we have undoubted authority for their arriving at no leſs than 100 years.

The moſchata, or Muſcovy duck of Ray, has a naked papillous face, and is a native of India. It is larger than the wild duck, being in length two feet. This ſpecies is pretty common in a domeſticated ſtate in almoſt every nation; and the breed ought to be encouraged, as there is more fleſh on it than on the common duck, and of a very high flavour. The eggs are rounder than thoſe of a duck, and in young birds frequently incline to green. They lay more eggs, and ſit oftener, than other ducks. In an unconfined ſtate they make the neſt on the ſtumps of old trees, and perch during the heat of the day on the branches of ſuch as are well clothed with leaves. When kept tame, they are ſufficiently docile; and the male will not unfrequently aſſociate and produce a mongrel breed with the common ducks. The name of Muſcovy duck was given to them from their exhaling a muſky odour, which proceeds from the gland placed on the rump in common with other birds.

The boſchas, or common wild duck, frequents the lakes of different countries, and feeds upon frogs and ſeveral ſorts of inſects. The wild ducks pair in the ſpring; build their neſts among ruſhes near the water, and lay from 10 to 16 eggs. The female is a very artful bird, and does not always make the neſt cloſe to the water, but frequently at a good diſtance from it; in which caſe the duck will take the young in its beak or between its legs. At moulting-time, when they cannot fly, they may be caught in great numbers. See DECOY.

Birds with flat bills, that find their food by groping, have three pair of nerves that extend to the end of their bills: theſe nerves are remarkably conſpicuous in the head and bill of the wild-duck, and are larger than thoſe of a gooſe or any other bird yet known: this is the reaſon they grope for food more than any other bird whatever. The common ſpecies of ducks take their origin from theſe; and may be traced to it by unerring characters. The drakes, however they vary in colours, always retain the curled feathers of the tail, and both ſexes the form of the bill, of the wild kind. Nature ſports in the colours of all domeſtic animals; and for a wiſe and uſeful end, that mankind may the more readily diſtinguiſh and claim their reſpective property. In France, this ſpecies is not often ſeen, except in winter; appearing in October, and going north in ſpring. They are caught in various manners; among the reſt, in decoys; the chief place for which is Picardy, where prodigious numbers are taken, particularly on the river Somme. It is alſo cuſtomary there to wait for the flocks paſſing over certain known places, and the ſportſman, having a wicker cage, containing a quantity of tame birds, lets out one at a time, at a convenient ſeaſon, which enticing the paſſengers within gunſhot, five or ſix are often killed at once by an expert markſman. They are now and then taken alſo by a hook baited with a bit of ſheep's lights, which ſwimming on the water, the bird ſwallows the bait, and with it the hook. Various other means of catching ducks and geeſe are peculiar to certain nations; of which one ſeems worth mentioning from its ſingularity: The perſon wiſhing to take theſe, wades into the water up to the chin, and having his head covered with an empty calabaſh, approaches the place where the ducks are; when they, not regarding an object of this ſort, ſuffer the man freely to mix with the flock; after which he has only to pull them by the legs under the water, one after another, till he is ſatisfied; returning as unſuſpected by the remainder as when he firſt came among them. This method is frequently put in practice on the river Ganges, uſing the earthen veſſels of the Gentoos inſtead of the calabaſhes: theſe veſſels are what the Gentoos boil their rice in, and are called Kutcharee pots (they likewiſe make a diſh for their tables in them, which goes by the ſame name): after theſe are once uſed, they look upon them as defiled, and of courſe throw them into the river as uſeleſs; and the duck-takers find them convenient for their purpoſe, as the ducks, from conſtantly ſeeing the veſſels float down the ſtream, look upon them as objects of full as little regard as a calabaſh. The above, or ſome ſuch method, is alſo practiſed in China as well as India. The Chineſe, however, though they make great uſe of ducks, do not prefer the wild ſort, being in general extremely fond of tame ones; and it is ſaid that the major part of theſe are hatched by artificial heat; the eggs, being laid in boxes of ſand, are placed on a brick hearth, to which is given a proper heat during the time required for hatching. The ducklings are fed with little craw-fiſhes and crabs, boiled and cut ſmall, and afterwards mixed with boiled rice; and in about a fortnight ſhift for themſelves, when the Chineſe provide them an old ſtepmother, who leads them where they are to find provender for themſelves; being firſt put on board a ſampane or boat, which is deſtined for their habitation, and from which the whole flock, often to the amount of 300 or 400, go out to feed, and return at command. This method is uſed nine months out of the twelve (for in the colder months it does not ſucceed) and is ſo far from a novelty, that it may be every where ſeen; but more eſpecially about the time of cutting the rice and gleaning the crop, when the maſters of the duck ſampanes row up and down the river according to the opportunity of procuring food, which is found in plenty, at the tide of ebb, on the rich plantations, as they are overflowed at high water. It is curious to ſee how the ducks obey their maſter; for ſome thouſands, belonging to different boats, will feed at large on the ſame ſpot, and on a ſignal given will follow their leader to their reſpective ſampanes, without a ſtranger being found among them. This is ſtill more extraordinary, if we conſider the number of inhabited ſampanes on the Tigris, ſuppoſed to be no leſs than 400,000, which are moored in rows cloſe to each other, with a narrow paſſage at intervals for boats to paſs up and down the river.

The galericulata, or Chineſe teal of Edwards, has a hanging creſt: and on the hinder part of the back, on both ſides, there is a crooked, flat, elevated feather; the creſt is green and red; and the back is brown, and ſpotted with blue; and erect feathers on the back are red and blunt; one edge of the inmoſt wing-feather, when the wings are ſhut, is raiſed over the back, and is red, and like a ſickle before. This moſt ſingular and elegant ſpecies is a native China and Japan, where it is kept by the inhabitants for the ſake of its beauty. It is not near ſo common in China as many other kinds, or perhaps they are politically held dear to the European purchaſers; they are frequently expoſed to ſale at Canton in cages, and the common price is from ſix to ten dollars per pair: they are not unfrequently brought to England alive; but require care, as they ſeem exceedingly tender. Attempts have been made to breed them in that country, but without ſucceſs, though they are familiar enough. The bird is known in Japan by the name of *Kimnodsui*. The Engliſh in China give it the name of *mandarin*.

ANASARCA, *n. s.* a ſort of dropſy, where the whole ſubſtance is ſtuffed with pituitous homours. For deſcription, cauſes and cure, ſee MEDICINE.

ANASARCOUS, *adj.* relating to an anaſarca; partaking of the nature of an anaſarca.

ANASTOMATIC, *adj.* that which has the quality of opening the veſſels, or of removing obſtructions. Anaſtomatics, comprehend all deobſtruent, cathartic, and ſudorific medicines.

ANASTOMOSIS, *n. s.* the inoſculation of veſſels, or the opening of one veſſel into another; as, of the arteries into the veins.

ANATHEMA, *n. s.* a curſe pronounced by eccleſiaſtical authority; excommunication. This word, among eccleſiaſtical writers, imports whatever is ſet apart, ſeparated, or divided; but is uſually meant to expreſs the cutting off a perſon from the privileges of ſociety and communion with the faithful. The anathema differs from excommunication in the circumſtances of being attended with curſes and execrations. It was practiſed in the primitive church againſt notorious offenders; and the form of that pronounced by Synecius againſt one Andronicus, is as follows: "Let no church of God be open to Andronicus, but let every ſanctuary be ſhut againſt him. I admoniſh both private men and magiſtrates, to receive him neither under their roof nor to their table; and prieſts more eſpecially, that they neither converſe with him living, nor attend his funeral when dead!" Several councils alſo have pronounced anathemas againſt ſuch perſons as they thought corrupted the purity of the faith. There are two kinds of anathemas, the one judiciary, and the other abjuratory. The former can only be denounced by a council, a pope, or a biſhop; the latter makes a part of the ceremony of abjuration, the convert being obliged to anathematize the hereſy he abjures.

ANATHEMA, in pagan antiquity, was an offering or preſent made to ſome deity, and hung up in the temple. Whenever a perſon left off his employment, it was uſual to dedicate the tools to the patron deity of the trade. Perſons too who had eſcaped from imminent danger, as ſhipwreck and the like, or had met with any other remarkable inſtance of good fortune, ſeldom failed to teſtify their gratitude by ſome preſent of this kind.

ANATHEMATICAL, *adj.* that which has the properties of an anathema; that which relates to an anathema.

ANATHEMATICALLY, *adv.* in an anathematical manner.

ANATHEMATISM, the ſame with ANATHEMA.

To ANATHEMATIZE, *v. a.* to pronounce accurſed by eccleſiaſtical authority; to excommunicate.

ANATHEMATIZING, the act of pronouncing an anathema: In which ſenſe it is the ſame with excommunicating. The word, however, is applied, not only to perſons, but to doctrines and opinions.

ANATOMICAL, *adj.* 1. Relating or belonging to anatomy.—2. Proceeding upon principles taught in anatomy.

ANATOMICALLY, *adv.* in an anatomical manner; according to the doctrine of anatomy.

ANATOMIST, *n. s.* he that ſtudies the ſtructure of animal bodies, by means of diſſection; he that divides the bodies of animals, to diſcover the various parts.

To ANATOMIZE, *v. a.* 1. To diſſect an animal—2. To lay any thing open directly, and by minute parts.

ANATOMY, *n. s.* 1. The art of diſſecting the body.—2. The doctrine of the ſtructure of the body.—3. The act of dividing any thing, whether corporeal or intellectual.—4. A ſkeleton.—5. A thin meagre perſon.

ANATOMY.

ANATOMY as an ART, means ſimply the operation of diſſecting, or artificially ſeparating the parts of an animal body; but as a SCIENCE, it comprehends all the objects of ſuch diſſection, which, in general, are to diſcover the various ſituations, figures, connections, powers and uſes of the parts, with the ſtructure, fabric and œconomy of the whole.

INTRODUCTION.

SECT. I. *History and Progress of Anatomy.*

This art ſeems to have been very ancient; though, for a long time, known only in an imperfect manner. The firſt men who lived muſt have ſoon acquired ſome notions of the ſtructure of their own bodies, particularly of the external parts, and of ſome even of the internal, ſuch as bones, joints, and ſinews, which are expoſed to the examination of the ſenſes in living bodies. This rude knowledge muſt have been gradually improved, by the accidents to which the body is expoſed, by the neceſſities of life, and by the various cuſtoms, ceremonies, and ſuperſtitions, of different nations. Thus, the obſervance of bodies killed by violence, attention to wounded men, and to many diſeaſes, the various ways of putting criminals to death, the funeral ceremonies, and a variety of ſuch things, muſt have ſhown men every day more and more of themſelves; eſpecially as curioſity and ſelf-love would here urge them powerfully to obſervation and reflection.

The brute creation having ſuch an affinity to man in outward form, motions, ſenſes, and ways of life; the generation of the ſpecies, and the effect of death upon the body, being obſerved to be ſo nearly the ſame in both; the concluſion was not only obvious, but unavoidable, that their bodies were formed nearly upon the ſame model. And the opportunities of examining the bodies of brutes were ſo eaſily procured, indeed ſo neceſſarily occurred in the common buſineſs of life, that the huntſman, in making uſe of his prey, the prieſt in ſacrificing, the augur in divination, and above all, the butcher, or thoſe who might out of curioſity attend upon his operations, muſt have been daily adding to the little ſtock of anatomical knowledge. Accordingly we find, in fact, that the South-ſea-iſlanders, who have been left to their own obſervation and reaſoning, without the aſſiſtance of letters, have yet a conſiderable ſhare of rude or wild anatomical knowledge. Dr. Hunter informs us, that when Omai was in his muſeum with Mr. Banks, though he could not explain himſelf intelligibly, they plainly ſaw that he knew the principal parts of the body, and ſomething likewiſe of their uſes; and manifeſted a great curioſity or deſire of having the functions of the internal parts of the body explained to him; particularly the relative functions of the two ſexes, which with him ſeemed to be the moſt intereſting object of the human mind. We may further imagine, that the philoſophers of the moſt early ages, that is, the men of curioſity, obſervation, experience, and reflection, could not overlook an inſtance of natural organization, which was ſo intereſting, and at the ſame time ſo wonderful, more eſpecially ſuch of them as applied to the ſtudy and cure of diſeaſes. We know that phyſic was a branch of philoſophy till the age of Hippocrates. Thus the art muſt have been circumſtanced in its beginning. We ſhall next ſee, from the teſtimony of hiſtorians and other writers, how it actually appeared as an art, from the time that writing was introduced among men; how it was improved, and conveyed down to us through a long ſeries of ages.

Civilization, and improvements of every kind, would naturally begin in fertile countries and healthful climates, where there would be leiſure for reflection, and an appetite for amuſement. Accordingly, writing, and many other uſeful and ornamental inventions and arts, appear to have been cultivated in the eaſtern parts of Aſia long before the earlieſt times that are treated of by the Greek or other European writers; and that the arts and learning of thoſe eaſtern people were in ſubſequent times gradually communicated to adjacent countries, eſpecially by the medium of traffic. The cuſtoms, ſuperſtitions, and climate of eaſtern countries, however, appear to have been as unfavourable to practical anatomy, as they were inviting to the ſtudy of aſtronomy, geometry, poetry, and all the ſofter arts of peace. Animal bodies there run ſo quickly into nauſeous putrefaction, that the early inhabitants muſt have avoided ſuch offenſive employments as anatomical enquiries, like their poſterity at this day. And in fact, it does not appear, by the writings of the Grecians, or Jews, or Phœnicians, or of other eaſtern countries, that anatomy was particularly cultivated by any of thoſe eaſtern nations. In tracing it backwards to its infancy, we cannot go farther into antiquity than the times of the Grecian philoſophers. As an art in the ſtate of ſome cultivation, it may be ſaid to have been brought forth and bred up among them as a branch of natural knowledge.

The æra of philoſophy, as it was called, began with Thales, the Mileſian, being declared, by a very general conſent of the people, the moſt wiſe of all the Grecians, 480 years before Chriſt. The philoſophers of his ſchool, which was called the Ionian, cultivated principally natural knowledge. Socrates, the ſeventh in ſucceſſion of their great teachers, introduced the ſtudy of morals, and was thence ſaid to bring down philoſophy from heaven to make men truly wiſe and happy. In the writings of his ſcholar and ſucceſſor Plato, we ſee that the philoſophers had carefully conſidered the human body, both in its organization and functions; and though they had not arrived at the knowledge of the more minute and intricate parts, which required the ſucceſſive labour and attention of many ages, they had made up very noble and comprehenſive ideas of the ſubject in general. The anatomical deſcriptions of Xenophon and Plato have had the honour of being quoted by Longinus, as ſpecimens of ſublime writing; and the extract from Plato is ſtill more remarkable for its containing the rudiments of the circulation of the blood. "The heart (ſays Plato) is the centre or knot of the blood-veſſels; the ſpring or fountain of the blood, which is carried impetuouſly round; the blood is the *pabulum* or food of the fleſh; and for the purpoſe of nouriſhment, the body is laid out into canals, like thoſe which are drawn through gardens, that the blood may be conveyed, as from a fountain, to every part of the pervious body."

Hippocrates was nearly contemporary with the great philoſophers of whom we have been ſpeaking, about 400 years before the Chriſtian æra. He is ſaid to have ſeparated the profeſſion of philoſophy and phyſic, and to have been the firſt who applied to phyſic alone as the buſineſs of his life. He is likewiſe generally ſuppoſed to be the firſt who wrote upon anatomy. We know of nothing that was written expreſsly upon the ſubject before; and the firſt anatomical diſſection which has been recorded, was made by his friend Democritus of Abdera. If, however, we read the works of Hippocrates with impartiality, and apply his accounts of the parts to what we now know of the human body, we muſt allow his deſcriptions to be imperfect, incorrect, ſometimes extravagant, and often unintelligible, that of the bones only excepted. He ſeems to have ſtudied theſe with more ſucceſs than the other parts, and tells us that he had an opportunity of ſeeing an human ſkeleton.

From Hippocrates to Galen, who flouriſhed towards the end of the ſecond century, in the decline of the Roman empire, that is, in the ſpace of 600 years, anatomy was greatly improved; the philoſophers ſtill conſidering it as a moſt curious and intereſting branch of natural knowledge, and the phyſicians as a principal foundation of their art. Both of them, in that interval of time, contributed daily to the common ſtock, by more accurate and extended obſervations, and by the lights of improving philoſophy. As theſe two great men had applied very particularly to the ſtudy of animal bodies, they not only made great improvements, eſpecially in phyſiology, but raiſed the credit of natural knowledge, and ſpread it as wide as Alexander's empire.

Few of Ariſtotle's writings were made public in his lifetime. He affected to ſay that they would be unintelligible to thoſe who had not heard them explained at his lectures; and, except the uſe which Theophraſtus made of them, they were loſt to the public for above 130 years after the death of Theophraſtus; and at laſt came out defective from bad preſervation, and corrupted by men, who, without proper qualifications, preſumed to correct and to ſupply what was loſt.

From the time of Theophraſtus, the ſtudy of natural knowledge at Athens was for ever on the decline; and the reputation of the Lycæum and Academy was almoſt confined to the ſtudies which are ſubſervient to oratory and public ſpeaking.

The other great inſtitution for Grecian education was at Alexandria in Egypt. The firſt Ptolemies, both from the love of literature, and to give true and permanent dignity to their empire, and to Alexander's favourite city, ſet up a grand ſchool in the palace itſelf, with a muſeum and a library, which, we may ſay, has been the moſt famed in the world. Anatomy, among other ſciences, was publicly taught; and the two diſtinguiſhed anatomiſts were Eraſiſtratus, the pupil and friend of Theophraſtus, and Herophilus. Their voluminous works are all loſt; but they are quoted by Galen almoſt in every page. Theſe profeſſors were probably the firſt who were authorized to diſſect human bodies; a peculiarity which marks ſtrongly the philoſophical magnanimity of the firſt Ptolemy, and fixes a great æra in the hiſtory of anatomy. And it was, no doubt, from this particular advantage which the Alexandrians had above all others, that their ſchool not only gained, but for many centuries preſerved, the firſt reputation for medical education. Ammianus Marcellinus, who lived about 650 years after the ſchools were ſet up, ſays, they were ſo famous in his time, that it was enough to ſecure credit to any phyſician, if he could ſay that he had ſtudied at Alexandria.

Herophilus has been ſaid to have anatomized 700 bodies. We muſt allow for exaggeration. Nay, it was ſaid, that both he and Eraſiſtratus made it a common practice to open living bodies, that they might diſcover the more ſecret ſprings of life. But this, no doubt, was only a vulgar opinion, ariſing from the prejudices of mankind; and accordingly, without any good reaſon, ſuch tales have been told of modern anatomiſts, and have been believed by the vulgar.

Among the Romans, though it is probable they had phyſicians and ſurgeons from the foundation of the city, yet we have no account of any of theſe applying themſelves to anatomy for a very long time. Archathagus was the firſt Greek phyſician eſtabliſhed in Rome, and he was baniſhed the city on account of the ſeverity of his operations. Archagathus, in the time of Pompey, attained ſuch reputation as to be ranked in the ſame claſs with Hippocrates. He ſeemed to have ſome notion of the air in reſpiration acting by its weight; and in accounting for digeſtion, he ſuppoſed the

food

the cuſtom of the famous academies of Italy. In the very end of the 16th century, the great Harvey, as was the cuſtom of the times, went to Italy to ſtudy medicine, for Italy was ſtill the ſeat of the favourite arts. And in the very beginning of the 17th century, ſoon after Harvey's return to England, his maſter in anatomy, Fabricius ab Aquapendente, publiſhed an account of the valves in the veins, which he had diſcovered many years before, and no doubt taught in his lectures when Harvey attended them. This diſcovery evidently affected the eſtabliſhed doctrine of all ages, that the veins carried the blood from the liver to all parts of the body for nouriſhment. It ſet Harvey to work upon the uſe of the heart and vaſcluar ſyſtems in animals; and, in the courſe of ſome years, he was ſo happy as to diſcover, and to prove beyond all doubt, the *circulation of the blood.* He taught his new doctrine about the year 1616, and printed it in 1628. It was by far the moſt important ſtep that has been made in the knowledge of animal bodies in any age. It not only reflected uſeful lights upon what had been already found in anatomy, but alſo pointed out the means of further inveſtigation. And accordingly we ſee that from Harvey to the preſent time, anatomy has been ſo much improved, that we may reaſonably queſtion if the ancients have been further outdone by the moderns in any other branch of knowledge. Harvey's doctrine, however, at firſt met with conſiderable oppoſition; but in the ſpace of about 20 years it was ſo generally and ſo warmly embraced, that it was imagined every thing in phyſic would be explained. But time and experience have taught us, that we ſtill are, and probably muſt long continue to be, very ignorant; and that in the ſtudy of the human body, and of its diſeaſes, there will always be an extenſive field for the exerciſe of ſagacity.

' After the diſcovery and knowlege of the circulation of the blood, the next queſtion would naturally have been about the paſſage and route of the nutritious part of the food or chyle from the bowels to the blood-veſſels: and, by good fortune, in a few years after Harvey had made his diſcovery, Aſellius, an Italian phyſician, found out the lacteals, or veſſels which carry the chyle from the inteſtines; and printed his account of them, with coloured prints, in the year 1627, the very year before Harvey's book came out. For a number of years after theſe two publications, the anatomiſts in all parts of Europe were daily opening living dogs, either to ſee the lacteals, or to obſerve the phenomena of the circulation. In making an experiment of this kind, Pecquet, in France, was fortunate enough to diſcover the thoracic duct, or common trunk of all the lacteals, which conveys the chyle into the ſubclavian vein. He printed his diſcovery in the year 1651. And now the lacteals having been traced from the inteſtines to the thoracic duct, and that duct having been traced to its termination in a blood-veſſel, the paſſage of the chyle was completely made out. The ſame practice of opening living animals furniſhed occaſions of diſcovering the lymphatic veſſels. This good fortune fell to the lot of Rudbec firſt, a young Swediſh anatomiſt; and then to Thomas Bartholine, a Daniſh anatomiſt, who was the firſt that appeared in print upon the lymphatics. His book came out in the year 1653, that is, two years after that of Pecquet. And then it was very evident, that they had been ſeen before by Dr. Highmore and others, who had miſtaken them for lacteals. But none of the anatomiſts of thoſe times could make out the origin of the lymphatics, and none of the phyſiologiſts could give a ſatisfactory account of their uſe. The circulation of the blood, and the paſſage of the chyle, having been ſatisfactorily traced out in full grown animals, the anatomiſts were naturally led next to conſider how theſe animal proceſſes were carried on in the child while in the womb of the mother. Accordingly the male and female organs, the appearances and contents of the pregnant uterus, the incubated egg, and every phenomenon which could illuſtrate generation, became the favourite ſubject for about 30 years with the principal anatomiſts of Europe. Thus it would appear to have been in theory: but Dr. Hunter believes, that in fact, as Harvey's maſter Fabricius laid the foundation for the diſcovery of the circulation of the blood, by teaching him the valves of the veins, and thereby inviting him to conſider that ſubject; ſo Fabricius, by his lectures, and by his elegant work, *De formato fœtu, et de formatione ovi et pulli*, probably made that likewiſe a favourite ſubject of Dr. Harvey. But whether he took up the ſubject of generation in conſequence of his diſcovery of the circulation, or was led to it by his honoured maſter Fabricius, it is certain he ſpent a great deal of his time in the enquiry; and publiſhed his obſervations in a book *De generatione animalium*, in the year 1651.

In a few years after this, Swammerdam, Van Horn, Steno, and De Graaf, excited great attention to the ſubject of generation, by their ſuppoſed diſcovery, that the females of viviparous animals have ovaria, that is, cluſters of eggs in their loins, like oviparous animals; which, when impregnated by the male, are conveyed into the uterus; ſo that a child is produced from an egg as well as a chick; with this difference, that one is hatched within, and the other without, the body of the mother.

Malpighi, a great Italian genius, ſome time after, made conſiderable advances upon the ſubject of generation. He had the good fortune to be the firſt who uſed magnifying glaſſes with addreſs in tracing the firſt appearances in the formation of animals. He likewiſe made many other obſervations and improvements in the *minutiæ* of anatomy by his microſcopical labours, and by cultivating comparative anatomy. This diſtinguiſhed anatomiſt gave the firſt public ſpecimen of his abilities, by printing a diſſertation on the lungs, *anno* 1661; a period ſo remarkable for the ſtudy of nature, that it would be injuſtice to paſs it without particular notice.

At the ſame time flouriſhed Bellinus at Florence, who was the firſt that introduced mathematical reaſoning in phyſic. In 1662, Simon Pauli publiſhed a treatiſe *De albandis oſſibus.* He had long been admired for the white ſkeletons he prepared; and at laſt diſcovered his method, which was by expoſing the bones all winter to the weather.

Johannes Swammerdam, of Amſterdam, alſo publiſhed ſome anatomical treatiſes; but was moſt remarkable for his knowledge of preſerving the parts of bodies entire for many years, by injecting their veſſels. He alſo publiſhed a treatiſe on reſpiration. wherein he mentioned his having figures of all the parts of the body, as big as the life, cut in copper, which he deſigned to publiſh, with a complete ſyſtem of anatomy. Theſe, however, were never made public by Swammerdam; but, in 1683, Bidloo, profeſſor of anatomy at Leyden, publiſhed a work, intitled *Anatomia corporis humani*, where all the parts were delineated in very large plates, almoſt as big as the life. Mr. Cowper, an Engliſh ſurgeon, bought 300 copies of theſe figures; and in 1698 publiſhed them, with an Engliſh text, quite different from Bidloo's Latin one; to which were added letters in Bidloo's figures, and ſome few figures of Mr. Cowper's own. To this work Mr. Cowper's name was prefixed, without the leaſt mention of Bidloo, except on purpoſe to confute him. Bidloo immediately publiſhed a very ill-natured pamphlet, called *Gulielmus Cowperus citatus coram tribunali*; appealing to the Royal Society, how far Cowper ought to be puniſhed as a plaigiary of the worſt kind, and endeavouring to prove him an ignorant deceitful fellow. Cowper anſwered him in his own ſtyle, in a pamphlet called his *Vindiciæ*; endeavouring to prove, either that Bidloo did not underſtand his own tables, or that they were none of his. It was even alledged, that thoſe were the tables promiſed by Swammerdam, and which Bidloo had got from his widow. This, however, appears to have been only an invidious ſurmiſe, there being unqueſtionable evidence that they were really the performance of Bidloo.

Soon after, Diembroeck, profeſſor of anatomy at Utrecht, began to appear as an author. His work contained very little original; but he was at great pains to collect from others whatever was valuable in their writings, and his ſyſtem was the common ſtandard among anatomical ſtudents for many years.

About the ſame time, Liewenhoeck, of Delft, improved conſiderably on Malpighi's uſe of miſcroſcopes. Theſe two authors took up anatomy where others had dropt it; and, by this new art, they brought a number of amazing things to light. They diſcovered the red globules of the blood; they were enabled to ſee the actual circulation of the blood in the tranſparent parts of living animals, and could meaſure the velocity of its motion; they diſcovered that the arteries and veins had no intermediate cells or ſpungy ſubſtances, as Harvey, and all the preceding anatomiſts, had ſuppoſed, but communicated one with the other by a continuation of the ſame tube. Liewenhoeck was in great fame likewiſe for his diſcovery of the animalcula in the ſemen. Indeed, there was ſcarcely a part of the body, ſolid or fluid, which eſcaped his examination; and he almoſt every where found, that what appeared to the naked eye to be rude undigeſted matter, was in reality a beautiful and regular compound.

After this period, Nuck added to our knowledge of the abſorbent ſyſtem already mentioned, by his injections of the lymphatic glands; Ruyſch, by his deſcription of the valves of the lymphatic veſſels; and Dr. Meckel, by his accurate account of the whole ſyſtem, and by tracing thoſe veſſels in many parts where they had not been before deſcribed.

Beſides theſe authors, Drs. Hunter and Munro have called the attention of the public to this part of anatomy, in their controverſy concerning the diſcovery of the office of the lymphatics. When the lymphatic veſſels were firſt ſeen and traced into the thoracic duct, it was natural for anatomiſts to ſuſpect, that as the lacteals abſorbed from the cavity of the inteſtines, the lymphatics, which are ſimilar in figure and ſtructure, might poſſibly do the ſame office with reſpect to other parts of the body: and accordingly, Dr. Gliſſon, who wrote in 1654, ſuppoſes theſe veſſels ariſe from cavities, and that their uſe was to abſorb; and Frederic Hoffman has very explicitly laid down the doctrine of the lymphatic veſſels being a ſyſtem of abſorbents. But anatomiſts in general have been of a contrary opinion; for from experiments, particularly ſuch as were made by injections, they have been perſuaded that the lymphatic veſſels did not ariſe from cavities, and did not abſorb, but were merely continuations from ſmall arteries. The doctrine, therefore, that the lymphatics, like the lacteals, were abſorbents, as had been ſuggeſted by Gliſſon and by Hoffman, has been revived by Dr. Hunter and Dr. Monro, who have controverted the experiments of their predeceſſors in anatomy, and have endeavoured to prove that the lymphatic veſſels are not continued from arteries, but are abſorbents.

To this doctrine, however, ſeveral objections have been ſtarted, particularly by Haller, (Elem. Phyſ. l. 24. §. 2, 3.); and it has been found, that before the doctrine of the lymphatics being a ſyſtem of abſorbents can be eſtabliſhed, it muſt firſt be determined whether this ſyſtem is to be found in other animals beſides man and quadrupids. Mr. Hewſon claims the merit of having proved the affirmative of this queſtion, by diſcovering the lymphatic ſyſtem in birds, fiſh, and amphibious animals. See *Phil. Trans.* vol. lviii. and lxix. And latterly, Mr. Cruikſhank has traced the ramifications of that ſyſtem in almoſt every part of the body; and from his diſſections, figures have been made, and lately publiſhed to the world. To Mr. Sheldon, alſo, we are much indebted for his illuſtration of this ſyſtem.

The gravid uterus is a ſubject likewiſe which has received conſiderable improvements, particularly relating to one very important diſcovery; viz. that the internal membrane of the uterus which Dr. Hunter has named *decidua*, conſtitutes the exterior part of the ſecundines or after-birth, and ſeparates from the reſt of the uterus every time that a woman either bears a child or ſuffers a miſcarriage. This diſcovery includes another, to wit, that the placenta is partly made up of an excreſcence of efflorеſcence from the uterus itſelf.

Theſe diſcoveries are of the utmoſt conſequence, both in the phyſiological queſtion about the connection between the mother and child, and likewiſe in explaining the phenomena of births and abortions, as well as in regulating obſtetrical practice.

The anatomiſts of the eighteenth century have improved anatomy, and have made the ſtudy of it much more eaſy, by giving us more correct as well as more numerous figures. It is amazing to think of what has been done in that time. We have had four large folio books of figures of the bones, viz. Cheſelden's, Albinus's, Sue's, and Trew's. Of the muſcles, we have had two large folios: one from Cowper, which is elegant; and one from Albinus, which, from the accuracy and labour of the work, we may ſuppoſe will never be outdone. Of the blood-veſſels we have a large folio from Dr. Haller. We have had one upon the nerves from Dr. Meckel, and another by Dr. Monro jun. We have had Albinus's, Roederer's, Jenty's, and Hunter's works upon the pregnant uterus; Weitbrecht and Leber on the joints and freſh bones; Soemerring on the brain; Zinn on the eye; Cotunnius, Meckel junior, &c. on the ear; Walter on the nerves of the thorax and abdomen; Dr. Monro on the burſæ mucoſæ, &c.

It would be endleſs to mention the anatomical figures that have been publiſhed in the laſt century, of particular and ſmaller parts of the body.—Thoſe elegant plates of the brain, however, juſt publiſhed by M. Vicq. d'Azyr, muſt not paſs without notice, eſpecially as they form part of an univerſal ſyſtem of anatomy and phyſiology, both human and comparative, propoſed to be executed in the ſame ſplendid ſtyle. Upon the brain alone, 19 folio plates are employed; of which ſeveral are coloured.

To the foreign treatiſes already mentioned, may be added thoſe recently publiſhed by Sabbatier and Plenck on anatomy in general. In Great-Britain, the writings of Keil, Douglaſs, Cheſelden, the firſt Monro, Winſlow, &c. are too well known to need deſcription. The laſt of theſe uſed to be recommended as a ſtandard for the ſtudents in anatomy; but it has of late given place to a more accurate and comprehenſive ſyſtem, in three volumes, publiſhed by Mr. Elliot of Edinburgh, upon a plan approved of by Dr. Monro, and executed by Mr. Fyfe. Dr. Simmons of London has alſo obliged the world with an excellent ſyſtem of anatomy; and another work, under the title of "Elements of Anatomy and the Animal Economy;" in which the ſubjects are treated with uncommon elegance and perſpicuity.

In the latter part of the ſeventeenth century, anatomy made two great ſteps, by the invention of injections, and the method of making what we commonly call *preparations*. Theſe two modern arts have really been of infinite uſe to anatomy; and beſides have introduced an elegance into our adminiſtrations, which in former times could not have been ſuppoſed to be poſſible. They aroſe in Holland under Swammerdam and Ruyſch, and afterwards in England under Cowper, St. Andre, and others, where they have been greatly improved.

The anatomiſts of former ages had no other knowledge of the blood-veſſels, than what they were able to collect from laborious diſſections, and from examining the ſmaller branches of them, upon ſome lucky occaſion, when they were found more than commonly loaded with red blood. But filling the vaſcular ſyſtem with a bright-coloured wax, enables us to trace the large veſſels with great eaſe, renders the ſmaller much more conſpicuous, and makes thouſands of the very minute ones viſible, which, from their delicacy, and the tranſparency of their natural contents, are otherwiſe imperceptible.—The modern art of corroding the fleſhy parts with a menſtruum, and of leaving the moulded wax entire, is ſo exceedingly uſeful, and at the ſame time ſo ornamental, that it does great honour to the ingenious inventor Dr. Nicholls. The wax-work art of the moderns might deſerve notice in any hiſtory of anatomy, if the maſters in that way had not been ſo careleſs in their imitation. Many of th ewax-figures are ſo tawdry, with a ſhow of unnatural colours, and ſo very incorrect in the circumſtances of figure, ſituation, and the like, that though they ſtrike a vulgar eye with admiration, they muſt appear ridiculous to an anatomiſt. But thoſe figures which are caſt in wax, plaſter, or lead, from the real ſubject, and which of late years have been frequently made, are, of courſe, very correct in all the principal parts, and may be conſidered as no inſignificant acquiſition to modern anatomy. The proper or principal uſe of this art is, to preſerve a very perfect likeneſs of ſuch ſubjects as we but ſeldom can meet with, or cannot well preſerve in a natural ſtate; a ſubject in pregnancy, for example.

The modern improved methods of preſerving animal bodies, or parts of them, has been of the greateſt ſervice to anatomy; eſpecially in ſaving the time and labour of the anatomiſt in the nicer diſſections of the ſmall parts of the body.. For now, whatever he has prepared with care, he can preſerve; and the object is ready to be ſeen at any time. And in the ſame manner he can preſerve anatomical curioſities or rarities of every kind; ſuch as parts that are uncommonly formed; parts that are diſeaſed; the parts of the pregnant uterus and its contents. Large collections of ſuch curioſities, which modern anatomiſts are ſtriving almoſt every where to procure, are of infinite ſervice to the art, eſpecially in the hands of teachers. They give ſtudents clear ideas about many things which it is very eſſential to know, and yet which it is impoſſible that a teacher ſhould be able to ſhow otherwiſe, were he ever ſo well ſupplied with freſh ſubjects.

As Anatomy is the baſis of the ſcience of medicine, patriots cannot but lament that neither it, nor the means of acquiring it, are treated with due reſpect in the U. States: for not only in ſome ſtates, is it rendered diſgraceful, by the enacting of laws, which the wiſdom of Europe has rendered obſolete; but in all of them, public opinion allows the rank of a phyſician to men who have totally neglected even the infant inſtitutions of their country. For we mention it with regret, that few, comparatively ſpeaking, of thoſe perſons called Doctors throughout the Union, have ever ſeen the inſide of either hoſpital, college, or dead body. And it is neither becauſe ſuch things do not exiſt among us, nor becauſe the charges attending them are exorbitant; but ſolely owing to the indifference of the public, who thoughtleſsly give encouragement to ſuch ignorant pretenders. But in ſpite of circumſtances ſo diſcouraging, the ſcience of Anatomy, though its bounds are not enlarged, has had the means of its acquiſition facilitated even here. Dr. Alexander Anderſon, of New-York, has completed an engraving on wood, in the manner of Mr. Bewick, thirty-ſix inches by eighteen, repreſenting a male human ſubject, deprived of the common integuments, and ſhewing, as well as the muſcles, part of the thoracic and abdominal viſcera, together with the organs of generation.—While we admire the talents of the artiſt, we beg leave to ſuggeſt, that ſhould he in future add to his performance figures of reference, it would be better adapted to aſſiſt and refreſh the memory of its poſſeſſors, to which purpoſe its uſe is limited: for it is impoſſible to learn anatomy to any practical purpoſe, without actual diſſection, and frequent demonſtrations on the real ſubject.

SECT. II. GENERAL VIEW *of the* SUBJECT.

This ſcience is commonly divided into two parts, viz. *Anatomy*, properly ſo called, and *Comparative Anatomy*. The firſt of theſe is confined ſolely to the human body: the latter includes all animals, ſo far as a knowledge of their ſtructure may tend to perfect our ideas of the human body. See COMPARATIVE ANATOMY.

Conſidered

Cconſidered merely as a branch of philoſophy, Anatomy ſeldom fails to attract the curioſity of people of taſte. The advice of the Grecian ſage, *Know thyſelf*, will doubtleſs apply to the knowledge of our corporeal frame, as well as to that of our intellectual. And if it is pleaſing to be acquainted with the general ſtructure of the body, is is certainly more ſo to diſcover all thoſe ſprings which give life and motion to the machine, and to obſerve the admirable mechaniſm by which ſo many different functions are executed. Aſtronomy and anatomy, as Dr. Hunter and Fontenelle have remarked, are ſtudies which preſent us with the moſt ſtriking view of the two greateſt attributes of the Supreme Being. The firſt fills the mind with the idea of his immenſity, in the magnitude, diſtances, and number of the heavenly bodies; the laſt, aſtoniſhes with his wiſdom, in the variety, delicacy, and minuteneſs of animal mechaniſm.

The human body has been ſtiled a microcoſm, or little world; as if it did not differ ſo much from the univerſal ſyſtem of nature in the ſymmetry and number of its parts as in their ſize. Galen's excellent treatiſe *De uſu partium*, was compoſed as a proſe hymn to the Creator; and aboudns with as irreſiſtible proofs of a ſupreme Cauſe and governing Providence, as we find in modern phyſico-theology. And Cicero dwells more on the ſtructure and oeconomy of animals than on all the productions of nature beſides, when he proves the exiſtence of the gods from the order and beauty of the univerſe. It would be endleſs to quote the many animated paſſages on this ſubject which are to be found in the words of thoſe phyſicians, philoſophers, and theologiſts, who have conſidered the ſtructure and functions of animals with a view towards the Creator. It is a view which muſt ſtrike one with a moſt awful conviction. Who can know and conſider the thouſand evident proofs of the aſtoniſhing art of the Creator, in forming and ſuſtaining an animal body ſuch as ours, without the moſt pleaſant enthuſiaſm? Can we ſeriouſly reflect upon this awful ſubject, without being almoſt loſt in adoration? without longing for another life after this, in which we may be gratified with the higheſt enjoyment, which our faculties and nature ſeem capable of, ſeeing and comprehending the whole plan of the Creator, in forming the univerſe, and in directing all its operations?

The more immediate purpoſes of anatomy, however, concern thoſe who are to be the guardians of health, as this ſtudy is neceſſary to lay a foundation for all the branches of medicine.—The more we know of our fabric, the more reaſon we have to believe, that if our ſenſes were more acute, and our judgment more enlarged, we ſhould be able to trace many ſprings of life which are now hidden from us: by the ſame ſagacity we ſhould diſcover the true cauſe and nature of diſeaſes; and thereby be enabled to reſtore the health of many, who are now, from our more confined knowledge, ſaid to labour under incurable diſorders. By ſuch an intimate acquaintſtnce with the oeconomy of our bodies, we ſhould diſcover even the ſeeds of diſeaſes, and deſtroy them before they had takan root in the conſtitution.

That anatomy is the very baſis of ſurgery every body allows. It is diſſection alone that can teach us, where we may cut the living body with freedom and diſpatch; where we may venture with great circumſpection and delicacy; and where we muſt not, upon any account, attempt it. This informs the *head*, gives dexterity to the *hand*, and familiarizes the *heart* with a ſort of inhumanity, to the uſe of cutting inſtruments upon our fellow creatures. Beſides the knowledge of our body, through all the variety of its *structure* and *operations* in a *sound* ſtate, it is by anatomy only, that we can arrive at the knowledge of the true nature of moſt of the diſeaſes which afflict humanity. The ſymptoms of many diſorders are often equivocal; and diſeaſes themſelves are thence frequently miſtaken, even by ſenſible, experienced, and attentive phyſicians. But by anatomical examination after death, we can with certainty find out the miſtake, and learn to avoid it in any ſimilar caſe.

This uſe of anatomy has been ſo generally adopted by the moderns, that the caſes already publiſhed are almoſt innumerable: MANGETUS, MORGAGNI, and many of the beſt modern writiers in phyſic, are full of them. And if we look among the phyſicians of the beſt character, and obſerve thoſe who have the *art* itſelf, rather than the *craſt* of the profeſſion at heart; we ſhall find them conſtantly requeſting leave to examine, after death, the bodies of ſuch patients as have died of any extraordinary or unaccountable diſeaſe. And certainly in all ſuch caſes, thoſe ſurviving relations, who would refuſe a phyſician this privilege, would ſhow a great want of public ſpirit and philanthropy.

Having thus conſidered the importance of the ſtudy, not only for the prevention and cure of diſeaſes, but in furniſhing the livelieſt proofs of divine wiſdom; the following queſtions ſeem naturally to ariſe: For what purpoſe is there ſuch a variety of parts in the human body? Why ſuch a complication of nice and tender machinery? Why was there not rather a more ſimple, leſs delicate, and *leſs* expenſive frame?

The late ingenious Mr. Hunter has anſwered all ſuch queſtions, in a very ſatisfactory manner, in his introductory lecture on anatomy; wherein, after ſupopſing that an *immaterial spirit* is about to be placed in a *corporeal* fabric, he commences an inquiry what will be neceſſary for her accommodation. “First then, (ſays he) the *mind*, the thinking immaterial agent, muſt be provided with a place of immediate reſidence, which ſhall have all the requiſites for the union of ſpirit and body; accordingly ſhe is provided with the *brain*, where ſhe dwells as governor and ſuperintendant of the whole fabric. In the next place, as ſhe is to hold a correſpondence with all the material beings around her, ſhe muſt be ſupplied with organs fitted to receive the different kinds of impreſſions which they will make. In fact, therefore, we ſee that ſhe is provided with the organs of ſenſe, as we call them: the eye is adapted to light; the ear to ſound; the noſe to ſmell; the mouth to taſte; and the ſkin to touch.

“Further: She muſt be furniſhed with organs of communication between herſelf in the brain and thoſe organs of ſenſe, to give her information of all the impreſſions that are made upon them: and ſhe muſt have organs between herſelf in the brain and every other part of the body, fitted to convey her commands and influence over the whole. For theſe purpoſes the nerves are actually given. They are chords, which riſe from the brain, the immediate reſidence of the mind, and diſperſe themſelves in branches through all parts of the body. They convey all the diffeent kinds of ſenſations to the mind, in the brain; and likewiſe carry out from thence all her commands or influence to the other parts of the body. They are intended to be occaſional monitors againſt all ſuch impreſſions as might endanger the well-being of the whole, or of any particular part; which vindicates the Creator of all things, in having actually ſubjected us to thoſe many diſagreeable and painful ſenſations, which we are expoſed to from a thouſand accidents in life. Moreover, the mind, in this corporeal ſyſtem, muſt be endued with the power of moving from place to place, that ſhe may have intercourſe with a variety of objects; that ſhe may fly from ſuch as are diſagreeable, dangerous, or hurtful, and purſue ſuch as are pleaſant or uſeful to her. And accordingly ſhe is furniſhed with limbs, and with muſcles and tendons, the inſtruments of motion, which are found in every part of the fabric where motion is neceſſary.

"But to ſupport, to give firmneſs and ſhape to the fabric; to keep the ſofter parts in their proper places; to give fixed points for, and the proper direction to its motions, as well as to protect ſome of the more important and tender organs from external injuries; there muſt be ſome firm prop-work interwoven through the whole. And in fact, for ſuch purpoſes the bones are given. The prop work muſt not be made into one rigid fabric, for that would prevent motion.—Therefore there are a number of bones. Theſe pieces muſt all be firmly bound together, to prevent their diſlocation. And this end is perfectly well anſwered by the ligaments. The extremities of theſe bony pieces, where they move and rub upon one another, muſt have ſmooth and ſlippery ſurfaces for eaſy motion. This is moſt happily provided for, by the cartilages and mucus of the joints. The interſtices of all theſe parts muſt be filled up with ſome ſoft and ductile matter, which ſhall keep them in their places, unite them, and at the ſame time allow them to move a little upon one another. And theſe purpoſes are anſwered by the cellular membrane or adipoſe ſubſtance. There muſt be an outward covering over the whole apparatus, both to give it compactneſs and to defend it from a thouſand injuries; which, in fact, are the very purpoſes of the ſkin and other integuments.

"Laſtly, the mind being formed for ſociety and intercourſe with beings of her own kind, ſhe muſt be endued with powers of expreſſing and communicating her thoughts by ſome ſenſible marks or ſigns; which ſhall be both eaſy to herſelf, and admit of great variety: and accordingly ſhe is provided with the organs and faculty of ſpeech, by which ſhe can throw out ſigns with amazing facility, and vary them without end.

"Thus we have built up an animal body, which would ſeem to be pretty complete: but as it is the nature of matter to be altered and worked upon by matter; ſo in a very little time ſuch a living creature muſt be deſtroyed, if there is no proviſion for repairing the injuries which ſhe muſt commit upon herſelf, and thoſe which ſhe muſt be expoſed to from without. Therefore a treaſure of blood is actually provided in the heart and vaſcular ſyſtem, full of nutritious and healing particles, fluid enough to penetrate into the minuteſt parts of the animal; impelled by the heart, and conveyed by the arteries, it waſhes every part, builds up what was broken down, and ſweeps away the old and uſeleſs materials. Hence we ſee the neceſſity or advantage of the heart and arterial ſyſtem. What more there is of this blood than enough, to repair the preſent damages of the machine, muſt not be loſt, but ſhould be returned again to the heart; and for this purpoſe the venous ſyſtem is actually provided. Theſe requiſites in the animal explain, *a priori*, the circulation of the blood.

"The old materials which were become uſeleſs, and are ſwept off by the current of blood, muſt be ſeparated and thrown out of the ſyſtem. Therefore glands, the organs of ſecretion, are given for ſtraining whatever is redundant, vapid or noxious from the maſs of blood; and when ſtrained, they are thrown out by emunctories, called organs of excretion. But now, as the machine muſt be conſtantly wearing, the reſpiration muſt be carried on without intermiſſion, and the ſtrainers muſt always be employed. Therefore there is actually a perpetual circulation of the blood, and the ſecretions are always going on.

"Even all this proviſion, however, would not be ſufficient; for that ſtore of blood would ſoon be conſumed, and the fabric would break down, if there were not a proviſion made for freſh ſupplies. Theſe we obſerve, in fact, are profuſely ſcattered round her in the animal and vegetable kingdoms; and ſhe is furniſhed with hands the fitteſt inſtruments that could have been contrived, for gathering them, and for preparing them in a variety of ways for the mouth. But theſe ſupplies, which we call food, muſt be conſiderably changed; they muſt be converted into blood. Therefore ſhe is provided with teeth for cutting and bruiſing the food, and with a ſtomach for melting it down: In ſhort, with all the organs ſubſervient to digeſtion.—The finer parts of the aliments only can be uſeful in the conſtitution: theſe muſt be taken up and conveyed into the blood, and the dregs muſt be thrown off. With this view the inteſtinal canal is actually given. It ſeparates the nutritious part, which we call *chyle*, to be conveyed into the blood by the ſyſtem of abſorbent veſſels; and the feces paſs downwards, to be conducted out of the body.

"Now we have got our animal not only furniſhed with what is wanted for its immediate exiſtence, but alſo with the powers of protracting that exiſtence to an indefinite length of time. But its duration, we may preſume, muſt neceſſarily be limited: for, as it is nouriſhed, grows, and is raiſed up to its full ſtrength and utmoſt perfection; ſo it muſt in time, in common with all material beings, begin to decay, and then hurry on to final ruin. Hence we ſee the neceſſity of a ſcheme for renovation. Accordingly wiſe Providence, to perpetuate, as well as preſerve his work, beſides giving a ſtrong appetite for life and ſelf-preſervation, has made animals male and female, and given them ſuch organs and paſſions as will ſecure the propagation of the ſpecies to the end of time.

"Thus we ſee, that by the very imperfect ſurvey which human reaſon is able to take of this ſubject, the animal muſt neceſſarily be complex in his corporeal ſyſtem, and in its operations. He muſt have one great and general ſyſtem, the vaſcular, branching through the whole for circulation: Another, the nervous, with its appendages the organs of the ſenſe, for every kind of feeling: And a third, for the union and connection of all thoſe parts. Beſides theſe primary and general ſyſtems, he requires others which may be more local or confined: One for ſtrength, ſupport, and protection; the bony compages: Another for the requiſite motions of the parts among themſelves, as well as for moving from place to place; the muſcular part of the body: Another to prepare nouriſhment for the daily recruit of the body; the digeſtive organs: and one for propagating the ſpecies; the organs of generation.

“ In taking this general ſurvey of what would appear, *a priori*, to be neceſſary for adapting an animal to the ſituations of life, we obſerve, with great ſatisfaction, that man is accordingly made of ſuch ſyſtems, and for ſuch purpoſes. He has them all; and he has nothing more, except the organs of reſpiration. Breathing it ſeemed difficult to account for *a priori:* we only know it to be in fact eſſentially neceſſary to life. Notwithſtanding this, when we ſaw all the other parts of the body, and their functions, ſo well accounted for, and ſo wiſely adapted to their ſeveral purpoſes, there could be no doubt that reſpiration was ſo likewiſe: And accordingly, the diſcoveries of Dr. Prieſtley have lately thrown light upon this function alſo as will be ſhown in its proper place.”

“ Of all the different ſyſtems in the human body, the uſe and neceſſity are not more apparent, than the wiſdom and contrivance which has been exerted, in putting them all into the moſt compact and convenient form: in diſpoſing them ſo, that they ſhall mutually receive, and give helps to one another; and that all, or many of the parts, ſhall not only anſwer their principal end or purpoſe, but operate ſucceſsfully and uſefully in a variety of ſecondary ways. If we conſider the whole animal machine in this light, and compare it with any machine in which human art has exerted its utmoſt; we ſhall be convinced beyond the poſſibility of doubt, that there are intelligence and power far ſurpaſſing what humanity can boaſt of.

“ One ſuperiority in the natural machine is peculiarly ſtriking.—In machines of human contrivance or art, there is no internal power, no principle in the machine itſelf, by which it can alter and accommodate itſelf to an injury which it may ſuffer, or make up any injury which admits of repair. But in the natural machine, the animal body, this is moſt wonderfully provided for, by internal powers in the machine itſelf; many of which are not more certain and obvious in their effects, than they are above all human comprehenſion as to the manner and means of their operation. Thus, a wound heals up of itſelf; a broken bone is made firm again by a callus; a dead part is ſeparated and thrown off; noxious juices are driven out by ſome of the emunctories; a redundancy is removed by ſome ſpontaneous bleeding; a bleeding naturally ſtops of itſelf; and a great loſs of blood, from any cauſe, is in ſome meaſure compenſated, by a contracting power in the vaſcular ſyſtem, which accommodates the capacity of the veſſels to the quantity contained. The ſtomach gives information when the ſupplies have been expended; repreſents, with great exactneſs, the quantity and quality of what is wanted in the preſent ſtate of the machine; and in proportion as ſhe meets with neglect, riſes in her demand, urges her petition in a louder tone, and with more forcible arguments. For its protection, an animal body reſiſts heat and cold in a very wonderful manner, and preſerves an equal temperature in a burning and in a freezing atmoſphere.

“ A farther excellence or ſuperiority in the natural machine, if poſſible, ſtill more aſtoniſhing, more beyond all human comprehenſion, than what we have been ſpeaking of, is the following. Beſides thoſe internal powers of ſelf-preſervation in each individual, when two of them, of different ſexes, co-operate, or act in concert, they are endued with powers of making other animals or machines like themſelves, which again are poſſeſſed of the ſame powers of producing others, and ſo of multiplying the ſpecies without end. Theſe are powers which mock all human invention or imitation. They are characteriſtics of the Divine Architect.”

Sect. III. Plan *of the* following Treatise *of* Anatomy.

Having thus given a general account of the ſubject, we ſhall next conſider the method to be obſerved in treating it. The ſtudy of the *human* body, as already noticed, is commonly divided into two parts. The firſt, which is called Anatomy, relates to the matter and ſtructure of its parts; the ſecond, called Physiology and *Animal Economy*, relates to the principles and laws of its internal operations and functions. As the body is a compound of ſolids and fluids, *Anatomy* is divided into, 1. The anatomy of the ſolids, and 2. The anatomy of fluids.

I. The solids, by which we mean all parts of our body, which are not fluid, are generally divided into two claſſes, viz. 1. The hard ſolids or bones. This part of anatomy is called osteology; which ſignifies the doctrine of the bones. 2. The ſofter ſolid; which part is called sarcology, viz. the doctrine of the fleſh.

This diviſion of the ſolids, has probably taken its origin from the vulgar obſervation, that the body is made of bone and fleſh. And as there are many different kinds of what are called ſoft or fleſhy parts, sarcology is ſubdivided into, 1. Angeiology, or the doctrine of veſſels; by which is commonly underſtood *blood-veſſels;* 2. Adenology, of glands: 3. Neurology, of nerves: 4. Myology of muſcles: and, 5. Splanchnology, of the viſcera or bowels. There is, beſides, that part which treats of the organs of ſenſe and of the integuments.

This diviſion of the ſolids is mentioned, rather for the ſake of explaining ſo many words, which are conſtantly uſed by anatomiſts, than for its importance or accuracy. For beſides many other objections, that might be urged, there are in the body three ſpecies of ſolids, viz. griſtle or cartilage, hair, and nails; which are of an intermediate nature between bone and fleſh; and therefore cannot ſo properly be brought into either the oſteology or the ſarcology. The cartilages are claſſed with the bones; becauſe the greateſt number of them are appendages to bones: and for the like reaſon the hair and the nails are claſſed with the integuments.

II. The Fluids of the human body may be divided into three kinds, which Dr. Hunter calls the *crude*, the *general* or *perfect*, and the *local* or *ſecreted fluid*. 1. By the *crude* fluid is meant the chyle, and whatever is abſorbed at the ſurfaces of the body; in other words, what is recently taken into the body, and is not yet mixed with or converted into blood. 2. The *general* or *perfect* fluid is the blood itſelf; to wit, what is contained in the heart, arteries and veins, and is going on in the round of the circulation. 3. The *local* or *ſecreted* are thoſe fluids peculiar to particular parts of the body, which are ſtrained off from the blood, and yet are very different in their properties from the blood. They are commonly called *ſecretions*; and ſome are uſeful, others excrementitious.

In treating of the *Phyſiology*, it is very difficult to ſay what plan ſhould be followed; for every method which has been yet propoſed, is attended with manifeſt inconvenience. The powers and operations of the machine have ſuch a dependence upon one another, ſuch connections and reciprocal influence, that they cannot well be underſtood or explained ſeparately. In this ſenſe our body may be compared to a circular chain of powers, in which nothing is firſt or laſt, nothing ſolitary or independent; ſo that wherever we begin, we find that there is ſomething preceding which we ought to have known. If we begin with the brain and the nerves, for example, we ſhall find that theſe cannot exiſt, even in idea, without the heart: if we ſet out with the heart and vaſcular ſyſtem, we ſhall preſently be ſenſible, that the brain and nerves muſt be ſuppoſed: or, ſhould we take up the mouth, and follow the courſe of the aliment, we ſhould ſee that the very firſt organ which preſented itſelf, ſuppoſed the exiſtence both of the heart and brain: Wherefore we ſhall incorporate the Phyſiology with the Anatomy, by attempting to explain the functions after we have demonſtrated the organs.

Sect. IV. Explanation *of the* General Terms *of* Anatomy.

All the ſolid parts of the body, (which are the chief ſubjects of anatomy, properly ſo called,) have been arranged under general claſſes, expreſſed by the names of bones, cartilages, ligaments, fibres, membranes, arteries, veins, nerves, muſcles, glands, &c. Theſe terms it is proper to explain, before we enter more particularly upon the ſubject.

A **bone** is that hard, ſolid, and moſt inflexible part of the body, which aſſiſts in forming the great frame-work of the human machine.—The bones having no nerves are quite inſenſible.

A **cartilage** is that whitiſh or pearl-coloured ſubſtance, which uſually covers the extremities of a bone.—Cartilages are ſofter than bone, but harder than any other part; ſmooth, pliable, and elaſtic.

A **ligament** is a white, fibrous, compact ſubſtance, more pliable than a cartilage, difficult to be broken or torn, and yielding but a very little when ſtretched. Bones, cartilages, and ligaments, will be deſcribed in their proper places.

Fibres are thoſe ſmall and ſimple filaments, which, by their different diſpoſitions and connections, compoſe all the other parts. Fibres are either membranous, fleſhy, tendinous, or bony, and run in various directions, according to the nature of the parts they form.

A **membrane** is a pliable network of fibres interwoven in the ſame plane. Membranes differ in thickneſs, according to the ſmallneſs of their fibres, and numbers of their planes. Theſe planes are termed *laminæ*, and are diſtinguiſhed according to their ſituation.

Vessels are canals, more or leſs flexible, compoſed of different membranes, termed *coats*. Some of them divide into branches, more and more minute, but ſtill remain hollow. The general deſign of the veſſels is to convey fluids. They are diſtinguiſhed into blood veſſels, lacteals, lymphatics, &c. The very laſt and ſmalleſt extremities of theſe are termed *capillaries*. Thoſe veſſels which receive the blood from the heart and diſtribute it throughout the body, are named *arteries*; thoſe which bring the blood back to the heart, are called *veins*.

Arteries may be diſtinguiſhed from veins in a dead body, by their greater thickneſs, and by their diameter being preſerved when divided, which is not the caſe with a vein.

Nerves are thoſe white chords which proceed from the cerebrum, cerebellum, and ſpinal marrow, and are ramified over all parts of the body.

The **Absorbents** are a ſyſtem of veſſels, whoſe office is to take up and convey away whatever comes in contact with their mouths or orifices. This ſyſtem conſiſts of *lacteals*, and *lymphatics*.

Muscles are maſſes of red fibres of various lengths.—The middle portion of each muſcle is ſaid to be fleſhy. The extremities are called *tendinous*, and thoſe gliſtening, tough, inelaſtic, inſenſible ſubſtances iſſuing from them, *tendons*.

Glands are cluſters, compoſed of blood veſſels and nerves, united together in different folds, contorſions, and intertextures, and inveſted by a membranous covering.—Their office is to ſeparate from the maſs of fluids, which they diſcharge either immediately, or by other veſſels, termed *excretory*.

Fat is an oily, ſoft ſubſtance, collected between the ſkin and the muſcles, in the interſtices of the muſcles, about the viſcera, &c. and contained in a fine ſpongy kind of network, called *cellular membrane*.

By the term **Viscera**, is underſtood parts contained in a great cavity, without being connected to it through their whole extent. Such are the ſtomach, inteſtines, &c. in the abdomen. Other anatomical terms will be explained as they occur.

PART I. OSTEOLOGY.

Sect. I. *Of the* Bones *in general, and their* Appendages.

Our Almighty Creator evidently deſigned the bones to give ſhape and firmneſs to the human fabric; to form levers for the muſcles to act upon, and to defend thoſe parts from external injury, which are moſt immediately neceſſary to life; as the brain, ſpinal marrow, heart, lungs, &c.—The fibre of a bone, when firſt formed, are very ſoft and gelatinous; until, by the addition of ſolid matter, they grow by degrees to the hardneſs of cartilage, and at length arrive at the ſtate of perfect bone. But this change is neither made in a very ſhort period, nor begun in all the parts of the bone at the ſame time. Flat bones, that have their fibres directed to all ſides, begin to oſſify in or near a middle point; but the cylindrical bones, and all others whoſe fibres are nearly parallel, begin about the middle of each fibre, and hence ſhoot forth to their extremities; not always indeed in continued lines, but frequently beginning new oſſifications, which ſoon join the former; and by the continual addition of this oſſifying matter, the bones increaſe till they become ſufficiently hard.

The oſſification of bones depends principally on their veſſels being ſo diſpoſed, and of ſuch diameters, as to ſeparate a liquor, which may eaſily turn into a bony ſubſtance, when it is deprived of its thinner parts; as ſeems plain from the obſervation of the callous matter ſeparated after fractures and ulcers, where part of the bone is taken out: For, in theſe caſes, the veſſels extending themſelves, and the liquors added to them, are gradually formed into granulated fleſh; which fills up the ſpace which the bone is taken from, and then hardens till it becomes as firm as any part of the bone. This happens frequently, even when the ends of the diſeaſed bone are at a conſiderable diſtance from each other.

The induration of bones is ſo greatly aſſiſted by their being expoſed, more than any other parts, to the ſtrong preſſure of the great weights they ſupport, to the violent contraction of the muſcles fixed to them, and to the force of the parts they contain, which endeavour to make way for their own further growth. By all this preſſing force, the ſolid fibres and veſſels of bones are thruſt cloſer, and ſuch particles of the fluids conveyed in theſe veſſels, as are fit to be united to the fibres, are ſooner and more firmly incorporated with them, while the remaining fluids are forcibly driven out by the veins, to be mixed with the maſs of blood. In conſequence of this, the veſſels gradually diminiſh as the bones harden. In old and conſumptive perſons, and ſometimes in diſeaſed or wounded limbs, bones decreaſe as well as the fleſhy parts, though not ſo faſt, becauſe of their hardneſs. Sometimes the oſſifying matter ſhoots out of the bones, and forms bony excreſcences; and frequently in very old men it is depoſited in the coats of the arteries, and renders them incapable of their functions, ſo that they no longer have power to propel the blood, and the extreme parts mortify.

Though the cartilages and arteries are moſt ſubject to theſe changes, yet no part is exempt from them; for a large portion of the muſcular ſubſtance of the heart itſelf has been found perfectly oſſified. On the other hand, it ſometimes happens, that there is a deficiency of this oſſifying matter. This is evident in ſome fractures, where no callus will form, and conſequently the bone remains diſunited. The ſame thing occurred once in the lower jaw of an adult perſon, where all that part on one ſide, which is beyond the teeth, was of a ſubſtance between that of a cartilage and a ligament. In children that have died of the rickets, the bones have proved ſoft and ſpongy; and the perioſteum in ſome places many times its natural thickneſs; but the cartilages and cartilaginous epiphyſes had no apparent alteration in their texture, though enlarged to more than twice their natural diameters. All cylindrical bones have a large middle cavity, which contains an oily MARROW, and a great number of leſſer cells towards their extremities, which contain a bloody marrow. The marrow is of very conſiderable uſe to the bones; for by entering their tranſeverſe canals, and paſſing from them into the longitudinal ones, it is communicated to all the plates to ſoften and connect their fibres, whereby they are preſerved from becoming too brittle; as we ſee they do in burnt bones, or thoſe long expoſed to the air, in people labouring under old age, lues, or ſcurvy. In all which caſes, the oil is either in too little quantity, or has its natural good qualities impaired. Beſides this advantage which the ſubſtance of bones has from the marrow, their articulations are ſaid to receive no leſs benefit from it: for it is thought, that the marrow paſſes into the articular cavities, through the holes which are in the bones near the large joints. And as a proof of this, it is alledged, that butchers, upon ſeeing the greater or leſſer quantity of marrow in the bones of cows, can tell whether they have travelled far or little before they were ſlaughtered.

Every one of the cells, that contain the marrow, is lined with a fine membrane, and that in the larger cells is alſo contained in thin membranous veſicles. Through the ſubſtance of theſe membranes, to which anatomiſts have given the name of *internal perioſteum*, the blood veſſels are alſo ſpread; their trunks entering obliquely, about the middle of the cylindrical bones. It is from the branches of theſe veſſels that the marrow is ſecreted, while other branches enter the internal ſubſtance of the bones for their nouriſhment; and the reaſon why they enter obliquely is, that they may not weaken the bones by dividing too many fibres in the ſame place. If the bones had been formed of the ſame quantity of matter, without any cavities, they would not, if they were ſtraight, be able to ſuſtain the ſame weight. But being made hollow, their ſtrength to reſiſt breaking tranſverſely is increaſed as much as their diameters are increaſed, without increaſing their weights: a mechaniſm which proves yet more convenient for birds, the bones of whoſe wings, and for the ſame reaſon their quills, have very large cavities. But the bones in the legs of all animals are more ſolid, being formed to ſupport weight; and men's bodies being ſupported by two limbs, the bones of thoſe limbs are therefore made more ſolid than thoſe of quadrupeds. In a fractured bone, in which the ſame kind of matter, that produced bone at firſt, is thrown out from the broken ends, there is formed a maſs of callous matter, of equal ſolidity with any part of the bone, and of equal or greater diameter. Hence the ſtrength of the bone in that place is even greater than it was before: a wiſe proviſion of nature, ſince bones, when once broken, are ſeldom ſet in as good a direction as at firſt; and therefore they would be more liable to be broke in the ſame place again, and would be reunited with greater difficulty, or perhaps not at all.

The firſt objects of conſideration in oſteology, are the body and the extremities of a bone. The ancients gave the name of *diaphyſis* to the body or middle part, and divided the extremities into *apophyſis* and *epiphyſis*. An apophyſis, or *proceſs*, as it is more commonly called, is an eminence continued from the body of the bone, whereas an epiphyſis is at firſt a ſort of an appendage to the bone, by means of an intermediate cartilage. Many epiphyſes, which appear as diſtinct bones in the fœtus, afterwards become apophyſes; for they are at length ſo completely united to the body of the bone as not be diſtinguiſhable from it in the adult ſtate. It is not unuſual, however, at the age of 18 and even 20 years, to find the extremities of bones ſtill in the ſtate of epiphyſis.

The names given to the proceſſes of bones are expreſſive of their ſhape, ſize, or uſe; thus if a proceſs is large and of a ſpherical form, it is called *caput*, or *head*; if the head is flatted, it is termed *condyle*. Some proceſſes, from their reſemblance to a ſtiletto, a breaſt, or the beak of a crow, are called *ſtyloid*, *maſtoid*, or *coracoid:* others are ſtyled *ridges* or *ſpines*. The two proceſſes of the os femoris derive their name of *trochanters* from their uſe.

Bones, as already obſerved, have their cavities as well as their proceſſes. Theſe cavities either extend quite through the ſubſtance, or appear only as depreſſions. The former are called *foramina* or *holes*, and theſe foramina are ſometimes termed *canals* or *conduits*, according to their form and extent. Of the depreſſions, ſome are uſeful in articulation. Theſe are called *cotyloid* when they are deep, as is the caſe with the os innominatum, where it receives the head of the os femoris; or *glenoid* when they are ſuperficial, as in the ſcapula, where it receives the os humeri. Of the depreſſions that are not deſigned for articulation, thoſe which have ſmall apertures are called *sinuses;* others that are large, and not equally ſurrounded by high brims, are ſtyled *foſſæ;* ſuch as are long and narrow, *furrows;* or if broad and ſuperficial without brims, *sinuosities*. Some are called *digital impressions*, from their reſemblance to the traces of a finger on ſoft bodies. The bones compoſing the ſkeleton are ſo conſtructed, that the end of every bone is perfectly adapted to the extremity of that with which it is connected, and this connection forms what is called their *articulation*.

ARTICULATION is divided into *diarthrosis*, *synarthrosis*, and *amphiarthrosis*, or moveable, immoveable, and mixed articulation. Each of the two firſt has its ſubdiviſions. Thus the *diarthrosis*, or moveable articulation, includes, 1. The *enarthrosis*, as it is called, when a large head is admitted into a deep cavity, as in the articulation of the os femoris with the os innominatum. 2. *Arthrodia*, when a round head is articulated with a ſuperficial cavity, as is the caſe of the os humeri and ſcapula. 3. *Ginglimus*, or hinge-like articulation, as in the connection of the thigh-bone with the tibia. The enarthroſis and arthrodia allow of motion to all ſides; the ginglimus only of flexion and extenſion.

The SYNARTHROSIS, or immoveable articulation, includes, 1. The ſuture, when the two bones are indented into each other, as is the caſe with the parietal bones. 2. Gomphoſis, when one bone is fixed into another, in the manner the teeth are placed in their ſockets.

The term AMPHIARTHROSIS is applied to thoſe articulations which partake both of the ſynarthroſis and diarthroſis, as is the caſe with the bones of the vertebræ, which are capable of motion in a certain degree, although they are firmly connected together by intermediate cartilages.

SYMPHYSIS is the union of two bones into one; as in the lower jaw, for inſtance, which in the fœtus conſiſts of two diſtinct bones, but becomes one in a more advanced age, by the oſſification of the uniting cartilage.—When bones are thus joined by the means of cartilages, the union is ſtyled *synchondrosis;* when by ligaments *syncurosis*.

Bones that are not calculated for motion, as thoſe of the ſcull, the oſſa innominata, &c. alſo bones with their epiphyſes, when they meet, preſs into each other, and form *sutures*, which ſoon diſappear in thoſe that join, while their oſſific matter is ſoft; but thoſe that grow harder before they meet, preſs more rudely into each other, and make more uneven ſutures, ſome of which in the ſcull remain to the greateſt age. It alſo happens ſometimes, that while a bone is oſſifying from its centre, a diſtant part begins a new oſſification, and forms a diſtinct bone, which may happen to be of any figure. Theſe bones are ofteneſt found in the lambdoidal ſuture, and are there called oſſa triquetra. But the ends or ſides of bones, that are intended for motion, are hindered from uniting, by the cartilages which cover them; for when theſe cartilages are eroded, the bones very readily unite, and form an anchyloſis.

The extremities of all thoſe bones that are articulated for very manifeſt motions, or that are not placed againſt other bones, are tipped with *epiphyses* or additional bones, which in ſome meaſure determine their growth and figure. The epiphyſes are united chiefly to ſuch bones as are deſtined for frequent and violent motion; and for this purpoſe they are wiſely framed of a larger diameter than the bone they belong to. By this means, the ſurface of contact between the two bones of any articulation being increaſed, their conjunction becomes firmer, and the muſcles inſerted into them act with greater force, by reaſon of their axes being further removed from the centre of motion.

Bones in general are compoſed of a great many plates, each of which is made up of fibres or ſtrings united by ſmaller fibrils; which being irregularly diſpoſed, and interwoven with the other larger fibres, make a reticular work. This texture is plainly ſeen in the bones of fœtuſes, which have not their parts cloſely compacted; and in the bones of adults which have been burnt, long expoſed to the weather, or whoſe compoſition has been looſened by diſeaſes. The chinks, which are generally made according to the directions of the larger fibres of bones, that have undergone the action of fire or of the weather, ſhew the greater ſtrength of theſe, than of the fibres which connect them.

But although the exterior part of bones is compoſed of firm compact plates, yet they are all more or leſs cavernous internally. In ſome (*e. g.* the thin part of the *scapula*) the ſolid ſides are brought ſo near, that little cavity can be ſeen; and in others (*os humeri*, *os femoris*, &c.) the cavities are large and viſible. But the internal ſpongy texture is evident in young animals; and ſome of it may be ſeen in thoſe of the greateſt age. This ſpongy cavernous internal part of bones is generally called their *cancelli*, or *lattice work*.

All the bones in the human body, except the teeth, and thoſe parts of bones which are covered with cartilage, or where muſcles or ligaments ariſe or are inſerted, are covered with a fine membrane, which upon the ſkull is called *pericranium*, but in all other parts *periosteum*. It ſerves for the muſcles to ſlide eaſy upon, and to prevent their being lacerated by the rough fibres which compoſe the bones. It is every where full of ſmall blood veſſels, which enter the bones for their nouriſhment; but the internal ſubſtance of the larger bones is nouriſhed by the veſſels, which, as has been already obſerved, enter obliquely through their middle.

The SYNOVIAL GLANDS are ſmall bodies, ſuppoſed to be of a glandular ſtructure, and exceedingly vaſcular, ſecreting a fluid of a clear mucilaginous nature, which ſerves to lucubrate the joints. They are placed in ſmall cavities in the articulations, ſo as to be capable of being greatly compreſſed by the motion of the joint, which expreſſes their juice in proportion to the degree of friction. When the ſynovia is wanting, or is of too thick a conſiſtence, the joint becomes ſtiff, and incapable of flexion or extenſion. This is what is called *anchyloſis*.

The Ligaments of the Joints are either *round* or *burſal*. The round ligaments are white, tendinous, and inelaſtic. They are ſtrong, flexible, and are found only in the joint of the knee, and in the articulation of the os femoris with the os innominatum. The burſal, or capſular ligaments, ſurround the whole joint like a purſe, and are to be found in the articulations which allow motion every way, as in the articulation of the arm with the ſcapula.

A few of thoſe ſacs, called Burſæ Mucoſæ, were known to former anatomiſts, but by much the greater number have been ſince diſcovered by Dr. Monro, who obſerves that they are to be met with in the extremities of the body only; that many of them are placed entirely on the inner ſides of the tendons, between theſe and the bones. Many others cover not only the inner, but the outer ſides of the tendons, or are interpoſed between the tendons and external parts, as well as between thoſe and the bones. A few ſuch ſacs are obſerved where the proceſſes of bones play upon the ligaments, or where one bone plays upon another. Their proper membrane is thin and tranſparent, but very denſe, and capable of confining air or any other fluid. It is joined to the neighbouring parts by the common cellular ſubſtance. Between the burſa and the hard ſubſtance of a bone, a thin layer of cartilage or of tough membrane is very generally interpoſed. To the cellular ſubſtance on the outſide of the burſa, the adipoſe ſubſtance is connected; except where the burſa covers a tendon, cartilage, or bone, much expoſed to preſſure or friction. In ſeveral places a maſs of fat, covered with the membrane of the burſa, projects into its cavity. The edges of this are divided into fringes. The inner ſide of the membrane is ſmooth, and is extremely ſlippery from the liquor ſecreted in it. The ſtructure of the burſæ bears a ſtrong reſemblance to the capſular ligaments of the joints.

It would be improper to conclude this ſection without mentioning the Skeleton. The word *ſkeleton*, which by its etymology implies ſimply a dry preparation, is uſually applied to an aſſemblage of all the bones of an animal united together in their natural order. It is ſaid to be a natural ſkeleton, when the bones are connected together by their own proper ligaments; and an artificial one, when they are joined by another ſubſtance, as wire, &c. The ſkeleton is generally divided into head, trunk, and extremities. The firſt diviſion includes the bones of the cranium and face. The bones of the trunk are the ſpine, ribs, ſternum, and bones of the pelvis. The upper extremity on each ſide conſiſts of the two bones of the ſhoulder, viz. the ſcapula and clavicle; the bone of the arm or os humeri; the bones of the fore-arm, and thoſe of the hand. The lower extremity on each ſide of the trunk conſiſts of the thigh bone and the bones of the leg and foot.

Sect. II. *Of the* Sutures *and* Bones *of the* Cranium.

The mutual indentation of one bone with another, forms what is called a Suture. Thoſe which have proper names we ſhall deſcribe; thoſe which have not, will be found to derive their names from the bones which they ſurround. 1. The *coronal ſuture* runs acroſs the ſkull, from one upper edge of the ſphenoidal bone to the other, and joins the parietal to the frontal bones. 2. The *ſagittal ſuture* joins the parietal bones; begins at the os occipitis, and is continued to the os frontis. In children it deſcends to the noſe, the os frontis in them being two bones; and ſometimes it is found in adult ſubjects. 3. The *lambdoidal ſuture* joins the back part of the oſſa bregmatis, or parietal bones, to the upper part of the occipital. In this ſuture are frequently obſerved ſmall bones called oſſa triquetra, and ſometimes they occur in other ſutures. 4. The *ſquamous ſuture* is formed by the upper part of the temporal and ſphenoidal bones wrapping over the lower edges of the parietal bones. 5. The *tranſverſe ſuture* runs acroſs the face through the bottoms of the orbits of the eyes. It joins the lower edge of the frontal bone to the os ſphenoides, maxillæ ſuperioris, oſſa naſi, unguis, plana, palati, and malarum.

An evident advantage, ariſing from the ſkull being divided into ſo many bones is, that it is never ſo liable to be fractured, nor to have fractures extended ſo far as would happen were it compoſed of one bone only. This ſtructure is alſo convenient to the proceſs of oſſification, as has been already ſhewn; and it is ſtill more important to infants in the birth, becauſe theſe bones not being perfect at that time, admit of being preſſed together, ſo as to make the head conform to the ſhape and dimenſions of the parts through which it is to paſs.

Ten of the bones of the head compoſe the Cranium, the uſe of which is, to contain the brain, and defend it from external injuries. Theſe bones merit particular deſcription.

1. & 2. The Ossa Parietalia are two large bones which compoſe the ſuperior and lateral parts of the ſkull. On their inſide they are remarkably imprinted by the arteries of the dura mater, exhibiting ſomewhat the appearance of the branches of a tree.

3. The Os Frontis forms the upper and fore part of the cranium. Its inferior parts compoſe the ſuperior portions of the orbit of the eyes, where, on its inſides, are impreſſed the valvuli of the brain. In its middle above the os ethmoides uſually ariſes a thin ſpine, which ſtrengthens that part of the bone, it being otherwiſe weak from its flatneſs. In ſome ſkulls this ſpine is wanting; but then the bone is uſually thicker in that place, and from its middle, externally, goes a proceſs which ſupports the bones of the noſe. Immediately above the os ethmoides in this bone is a ſmall blind hole, through which runs a vein into the beginning of the longitudinal ſinus of the dura mater; and on the upper edge of each orbit, a ſmall perforation, or notch, through which nerves and an artery paſs to the forehead; it has alſo a ſmall hole in each orbit, near the os planum, through which paſſes a branch of the fifth pair of nerves. In the ſubſtance of this bone near the noſe are two, three, four, and ſometimes five ſinuſes, which open into the noſe; they differ very much in different perſons, and are very rarely found in children. Theſe ſinuſes, and the ſpine in this bone, make it very dangerous, if not impracticable, to apply a trephine on the middle and lower part of the forehead.

4. The Os Ethmoides, or *ſieve-like bone*, is about two inches in circumference, and is ſeated in the anterior part of the baſis of the ſkull, being almoſt ſurrounded by the

bone laſt deſcribed. It is pierced with a number of holes, through which the olfactory nerves paſs. From its middle ariſes a large proceſs named criſta galli; and oppoſite to this a thin one which in part divides the noſe. The greater part of the laminæ ſpongioſæ in the noſe belong to this bone.

5. The Os Sphenoides is of ſo very irregular a ſhape, as ſcarcely to allow of verbal deſcription. It is ſeated in the middle of the baſis of the ſkull, and is bounded by the os frontis, ethmoides, vomer, occipitis, maxillæ ſuperioris, oſſa parietalia, palati, malarum, temporum, and petroſa, which are parts of the former bones. In its inſide, next the brain, is a cavity named cella turcica, which is bounded by four proceſſes called clinoides; under the two foremoſt of which paſs the internal carotid arteries, and from their outſides are continued two thin long proceſſes upon that part of the frontal bone, which ſeparates the anterior lobes of the brain from the poſterior. Oppoſite to the cella turcica is a proceſs which makes part of the ſeptum narium. On the outer ſide of the ſkull adjoining to the upper jaw, are two proceſſes of this bone on each ſide, named pterygoides, from which ariſe one on each ſide near the palate, which have no name. Over theſe paſs the tendons of the pterygoſta-phalina externi muſcles; and nearer towards the occiput, between theſe and the ſtyloid proceſſes of the oſſa petroſa, ariſe two more ſmall rugged proceſſes. Under the cella turcica, in this bone, is a ſinus or two, moſtly found in adults, but in children, conſiſting only of ſuch a ſpongy ſubſtance as is ſeen in the ends of ſome of the bones. According to ſome writers, this ſinus belongs properly to the os ethmoides. At the inſide of the baſis of the two anterior clinoid proceſſes are two round holes, which are the firſt foramina of the ſkull; through theſe the optic nerves paſs. Almoſt under theſe, towards the ſides of the ſkull, are two irregular ſlits, named foramina lacera, or the ſecond foramina of the ſkull, through which paſs nerves and blood veſſels into the orbits of the eyes. Under theſe again, towards the occiput, are two round holes, which make the third foramina, and through which paſs nerves to the face. About half an inch nearer to the occiput are two more, of an oval figure, which are the fourth foramina, and through which paſs the largeſt branches of the fifth pair of nerves. A ſtraw's breadth farther are two very ſmall ones, called the fifth foramina, through which thoſe branches of the carotid arteries enter that are beſtowed upon the dura mater. Between this laſt deſcribed bone and the oſſa petroſa are two large rough holes, in which are ſometimes ſeen large veins; and from theſe holes, through part of the os ſphenoides, under the pterygoid proceſſes proceed the ſmall apertures, through which paſs arteries to the back part of the noſe.

6 & 7. The two Ossa Temporum are ſituated below the parietal bones, at the middle and lower parts of the ſides of the ſcull. They have each, at their back parts, one large ſpongy proceſs called mammillaris, or maſtoideus; and from the lower and middle parts of each, a proceſs iſſues, which joins the oſſa malarum, and which is named *zygomalis* or *zygomaticus*.

8 & 9. The two Ossa Petrosa lie between the former bones and the occipital bones, or rather are portions of the former, as they are never found ſeparate in adult bodies. Each on its outſide has one large ſlender proceſs called ſtyliformis, and near the ſide of this proceſs a foramen, running obliquely forwards into the ſcull, and through which the carotid arteries paſs to the brain. Theſe are the ſixth foramina, and two foramina in the inſide of the ſcull leading to the organs of hearing, which are the ſeventh foramina. The ridges on the upper parts of each of theſe bones help to keep the brain ſteady, and are ſtrong ſupports to the thin and flat parts of the ſcull. What remains to be ſaid of this bone belongs properly to the organs of hearing, to which we refer. Between the laſt deſcribed bones and the following bones are two large holes, which are the eighth foramina. Through theſe paſs the eighth pair of nerves and the lateral ſinuſes. Sometimes there are two on each ſide, one for the nerve and one for the ſinus. To theſe foramina we may add another very ſmall one on each ſide, through which paſs the *portiones duræ* of the auditory nerves; and ſometimes there is another for the paſſage of the artery.

10. The Os Occipitis forms all the back part of the ſcull. It is bounded by the ſphenodial, temporal, petroſal, and parietal bones. It has two ſmall apophyſes, by which it is articulated to the ſpine. Near thoſe apophyſes are two ſmall foramina, which are the ninth of the ſcull; and through them paſs the ninth pair of nerves. Between theſe is the great or tenth foramen, through which the medulla oblongata deſcends into the ſpine, the cervical arteries enter, and the cervical veins paſs out. In the inſide of this bone is a crucial ſpine impreſſed by the longitudinal and lateral ſinuſes; and on the outſide, oppoſite to the middle of this ſpine, in ſome bodies, is an apophyſis, and from that down to the great foramen a ſmall thin ſpine. The ſpines in this bone are of the ſame uſe with thoſe in the os frontis and other bones, viz. to ſtrengthen it. The thinner parts of the bone are alſo defended by the muſcles that cover them; a kind of proviſion which is very neceſſary, ſince we can leaſt defend this part, and blows here are often attended with the moſt fatal conſequences. There exiſts in moſt ſculls a foramen behind each apophyſis of the occipital bone. Through theſe paſs ſinuſes from the lateral ſinuſes to the external cervical veins; and by means of theſe paſſages, as in all other communications of the ſame ſort, the blood paſſes from thoſe that happen to be ſurcharged by any poſture of the head, into thoſe that from the ſame poſture would have been almoſt empty. Such ſculls as want theſe foramina have two ſinuſes which anſwer the ſame purpoſe. Any perſon acquainted with each bone of the cranium, can, without difficulty, examine them as they ſtand united, ſo as to know the ſhapes, ſizes, diſtances, &c. of their ſeveral parts, and the forms, capacities, &c. of the cavities formed by them. This is of great uſe towards underſtanding the anatomy of the parts contiguous to, contained within, or connected with them.

Sect. III. *Of the* Bones *of the* Face, *and* Mouth.

The face is that irregular pile of bones which compoſe the fore and under part of the head. Theſe are divided by authors into the *upper* and *lower maxillæ*, or jaws. The upper jaw conſiſts of 13 bones, excluſive of the teeth. Of theſe 6 are placed on each ſide of the maxilla ſuperior, and one in the middle. The bones, which are in pairs, are the oſſa naſi, oſſa malarum, oſſa unguis, oſſa maxillaria, oſſa palati, and oſſa ſpongioſa inferiora. The ſingle bone is the vomer.

1. The **Ossa Nasi** make the upper part of the noſe, and form that kind of arch, which is fitteſt to ſuſtain ſuch injuries as the noſe is moſt expoſed to, as blows, bruiſes, &c.

2. The **Ossa Malarum** compoſe the anterior, lower, and outer parts of the orbits of the eyes. They have each a ſhort proceſs, which proceſs joins the proceſſus jugales of the temporal bones, and form arches which have been called oſſa jugalia.

3. **Ossa Unguis** are ſituated immediately below the os frontis towards the noſe, and within the orbits of the eyes, whoſe anterior and inner parts they help to compoſe. Between each of theſe and the upper jaw is a foramen as large as a gooſe quill, for the paſſage of the lachrymal duct into the noſe. Through this the puncta lachrymalia carry off any ſuperfluous moiſture from the eyes.

4. The **Os Maxillare Superior** is often deſcribed as ſingle, though it evidently conſiſts of two bones joined by a ſuture, which is ſcarce ever obliterated. It has two proceſſes, which join the os frontis, and make part of the noſe; and a third, which joins to the cartilage of the ſeptum naſi. Its upper and outer parts compoſe the lower portions of the orbits of the eyes; its lower ſide, all that part of the face under the cheeks, eyes, and noſe to the mouth, and two thirds of the roof of the mouth. A little below the orbits of the eyes, in this bone, are two holes, and behind the dentes inciſores one more, which divides into two, as it opens into the noſe, on each ſide of the ſeptum naſi. Between the poſterior grinding teeth and the orbits of the eyes are two great ſinuſes, called antra maxillæ ſuperioris, which open in the upper part of the noſe. In the lower edge of this jaw are the alveoli, or ſockets for the teeth. All the body of the maxillary bone is hollow and leaves a large ſinus, which is commonly called antrum highmorianum. When the os maxillare is ſeparated from all the other bones of the ſkeleton, its antrum appears to have a large aperture into the noſtrils; but, in a recent ſubject, it is ſo covered at its back part of the palate bone, in the middle by the os ſpongioſum inferius, and before by a ſtrong membrane, that one or ſometimes two holes, ſcarcely ſo large as a crow quill, are only left at the upper part; which, after a ſhort winding proceſs, open into the noſtrils between the two oſſa ſpongioſa. At the bottom of this cavity, we may often obſerve ſome protuberances, in which the ſmall points of the roots of the teeth are contained. This cavern and the ſockets of the teeth are often divided by the interpoſition of only a very thin bony plate, which is liable to be eroded by matter, or to be broke in drawing a tooth.

5. The **Ossa Palati** are two ſmall bones that form the back part of the roof of the mouth, and a ſmall part of the bottom of each orbit. Between the oſſa palati and os maxillare, near the pterygoid proceſſes of the ſphenoidal bone, are two ſmall foramina, through which arteries and nerves paſs to the palate.

6. The **Os Spongiosum** is uſually treated as a diſtinct bone though it is only the ſpongy laminæ in the noſe, of the os ethmoides and oſſa plana, but chiefly of the os ethmoides, to which it uſually adheres. The **ossa turbinata**, or **spongiosa inferiora**, reſemble the ſuperior oſſa ſpongioſa in ſhape and ſubſtance, but have their anterior and upper edges contiguous to the tranſverſe ridges of the naſal proceſſes of the maxillary and palate bones. From their upper ſtraight edge, two ſmall proceſſes ſtand out: the poſterior, which is the broadeſt, deſcends to cover ſome of the antrum highmorianum; the anterior riſes up to join the os unguis, and to make part of the lachrymal duct.

7. The **Vomer**, ſo called from its reſemblance to a *plowſhare*, is ſeated between the bones of the palate, and the ſphenoidal bone. It is alſo joined to the proceſs of the ethmoides, and part of the lower jaw. Its fore part is ſpongy, and is continued to the middle cartilage of the noſe. This bone and cartilage form the *ſeptum naſi*.

8. The **Ossa Plana** are ſeated immediately beyond the foregoing bones, in the orbits of the eyes, and are near thrice as big. They are rather ſmooth ſurfaces of the os ſpongioſum, than diſtinct bones, and are very often imperfect.

9. The **Maxilla Inferior**, or *Lower Jaw*, is articulated with looſe cartilages to the temporal bones, by two proceſſes, named condyloides. Near theſe ariſe two more, called coronales, and at the inſide of the chin a ſmall rough proceſſus innominatus. In the inſide of this bone, under each proceſſus coronalis, is a large foramen, which runs under the teeth, and paſſes out near the chin. Through this foramen, the veſſels paſs that belong to the teeth; and in the upper edge of this jaw are the **alveoli** or ſockets for the **teeth**, which ſeldom exceed 16 in each jaw. The four firſt in each are called *inciſores*, the two next *canini*, the reſt *molares*. The four laſt of theſe are named *dentes ſapientiæ*, becauſe they do not appear till men arrive at years of diſcretion. The inciſores and canini have only one ſingle root, but the molares more; the eight firſt two; and the reſt, ſome three, ſome four, eſpecially in the upper jaw; where alſo they are ſpread wider, becauſe that jaw being more ſpongy than the other, the teeth need more ſpace to fix them. Each of theſe roots has a foramen, through which paſs an artery, vein, and nerve, which are expanded in a fine membrane that lines the cavity in each tooth. Theſe veſſels and membrane are the ſeat of the *tooth-ach*. The teeth of children caſt off in conſequence of the preſſure of the new teeth, which cauſes the roots of the firſt teeth to be abſorbed. When teeth are drawn from the jaws of adult perſons, the ſockets are abſorbed, and new teeth very rarely, if ever, ſupply the place of thoſe that have been extracted. All the teeth are covered, above the ſocket, with a very hard, white vitreous ſubſtance called *enamel*, which is equally uſeful and ornamental. It is thickeſt on the grinding ſurface, and becoming gradually thinner, terminates inſenſibly at the neck of the tooth. It ſerves to preſerve the teeth, and while the enamel remains ſound, there is no danger of *tooth-ach*; but when once it is broken or injured, it is impoſſible to reſtore it.

We cannot cloſe this ſection without taking notice of the **Os Hyoides**, which, though it is not one of the *face*, cannot be ranked any where ſo properly, as after the bones of the *mouth*. It is placed at the root of the tongue, and was ſo called by the ancients, on account of its ſuppoſed reſemblance to the Greek letter *υ*. The body, which is the middle and broadeſt part of the bone, is ſo placed that it may be eaſily felt at the fore part of the throat. Anteriorly it is irregularly convex, and its inner ſurface is unequally concave. Its cornua, or horns, which are flat and a little bent, being much longer than the body, may be deſcribed as forming the ſides of the *υ*. The appendices, or little horns, are two proceſſes which riſe up from the articulations of the cornua with the body, and are uſually connected with the ſtyloid proceſs on each ſide by means of a ligament. The uſes of this bone are to ſupport the tongue, and afford attachment to a great number of muſcles; ſome of which perform the motions of the tongue, while others act on the larynx and fauces.

SECT. IV. *Of the* BONES *of the* TRUNK.

The TRUNK conſiſts of the *ſpine*, *pelvis* and *thorax*. 1. The SPINE is compoſed of 24 vertebræ, beſides thoſe of the os ſacrum and coccygis. Seven of theſe belong to the neck, and the firſt of them is called *atlas*, becauſe it immediately ſupports the head. Its upper ſide has two cavities, into which the apophyſes of the os occipitis are received; but theſe two cavities together, unlike all other joints, are laterally portions of concentric circles, by which means they are but as one joint, and ſo ſuffer the head to move eaſily ſide ways, which otherwiſe it could no more do than the knee, which alſo has two heads and two cavities. The under ſide of this bone has a very flat articulation with the next; by which means it is fitted for a rotatory motion. The ſecond vertebræ is called *dentata*, or axis, from a proceſs which paſſes through the former bone, and is the axis upon which it turns; nevertheleſs all the vertebræ of the neck contribute ſomething to the rotatory motion of the head. The *proceſſus dentatus* is ſtrongly tied to the os occipitis, and to the atlas by ligaments, to prevent its hurting the ſpinal marrow. Of the vertebræ 12 belong to the back, and five to the loins. The os ſacrum conſiſts ſometimes of five, ſometimes of ſix bones, and the os occygis of four. If the ſpine had been compoſed of fewer bones, they muſt have either not been capable of bending ſo much and ſo variouſly as they do, or have bent more in each joint, which would have endangered the ſpinal marrow, that runs through them.

The ſuperior VERTEBRÆ of the neck being fixed behind the head's centre of gravity, the neck is ſo far bent forward, as that the laſt of theſe vertebræ, which has a firm bearing upon thoſe of tho thorax, falls exactly under the centre of gravity. Thoſe of the thorax are bent backwards, behind the centre of motion, to make room for the parts contained in the thorax; and that they might not be made too weak by this ſtructure, they are formed for leſs motion than the other vertebræ. Thoſe in particular which are bent fartheſt from the centre of gravity have the leaſt motion. The middle vertebræ of the loins are again bent forwards under the centre of gravity, or near it; and from thence they go backwards to the os ſacrum, where being fixed to the oſſa innominata behind the centre of gravity, the articulation is therefore firm and without motion; and from thence the oſſa innominata are ſo formed, as that their ſockets, into which the thigh bones are admitted and enjoy a free motion, are exactly under the centre of gravity.

In all theſe vertebræ, except the firſt, there is a middle anterior ſpongy body, by which they are firmly articulated with a very ſtrong intervening ligament; from the middle of the hind part of each, except the firſt, ſtands a proceſs named *ſpinalis*; and from every one a proceſs on each ſide, called *tranſverſalis*, and two ſuperior, and two inferior ſhort ones, by which the back parts of the vertebræ are articulated, named *obliqui ſuperiores*, and *inferiores*. The fore part of the back, are flat forwards, to make room for the trachea. The third and fourth of the back are acute, to give way to the veſſels of the lungs and heart, and they are directed to the right ſide for the better ſituation of the heart, which makes that ſide of the breaſt more convex than the other. The ſpinal proceſſes of the 2d,3d, 4th, and 5th vertebræ of the neck are forked; the two laſt long and horizontal, the three or four upper ones of the back like them, only a little declining. The middle ones of the back run obliquely downwards, and the proceſſes of the remaining vertebræ become ſucceſſively thicker, ſtronger, and leſs declining; thoſe of the loins being horizontal, like the laſt of the neck. The muſcles, that are inſerted into the ſpinal proceſſes of the vertebræ of the neck and loins act with more ſtrength than thoſe of the back, becauſe their proceſſes being perpendicular to the ſpine, they are longer levers. Beſides, thoſe of the back almoſt touch one another, to prevent much motion, becauſe it would interrupt reſpiration; but more motion being neceſſary in the neck and loins, their proceſſes are contrived accordingly. The tranſverſe proceſſes of the vertebræ of the neck are perforated, for the admiſſion of the cervical blood veſſels, and bowed downwards, and hollowed, for the paſſage of the cervical nerves. The eight or nine upper ones of the back receive the upper ribs; and the reſt, with thoſe of the loins, ſerve only for the origin and inſertion of muſcles.

2. The OS SACRUM has two upper oblique proceſſes, ſome ſmall ſpinal proceſſes, and two foramina in each interſtice of the bones which compoſe it, both before and behind.

3. The OS COCCYGIS, or *rump-bone*, is that triangular chain of bones depending from the os ſacrum; each bone becoming ſmaller as they deſcend, till the laſt ends almoſt in a point. The os coccygis is convex behind, and concave before; from which crooked pyramidal figure, which was thought to reſemble a cuckow's beak, it has got its name. This bone conſiſts of four pieces in people of middle age. In children, almoſt the whole of it is cartilage. In old age, all the bones are united, and become frequently one continued bone with the os ſacrum.

There is a large foramen through every bone of the ſpine, the coccygis excepted. Theſe foramina together make a channel through the ſpine, deſigned to contain the medulla ſpinalis; and in each ſpace between the vertebræ are two large holes for the nerves to paſs out. Nothing can be more worthy of admiration, than the proviſion made to prevent luxations in this chain of bones, ſuch luxations being worſe than any other, becauſe of the ſpinal marrow that is contained within. The bodies of the vertebræ are all in the ſame manner connected by ſtrong intervening ligaments or cartilages. In the neck the oblique proceſſes of the received bone are wrapped over thoſe of the receiving bone, which forbids their luxating forwards. The tranſverſe proceſſes, with a ſmall apophyſis of the body of the ſame bone, in like manner, ſecure them from ſlipping backwards; and an apophyſis on each ſide of the body of the receiving bone, hinders them from ſlipping on either ſide. The vertebræ of the back are hindered from diſlocating forwards by the ſame proviſion with thoſe of the neck; and from luxating backwards, by the ribs which are faſtened to the tranſverſe proceſſes of the inferior vertebræ, and againſt the back part of the body of the next ſuperior. They alſo hinder them from diſlocating to either ſide; but the laſt ribs are not fixed to the tranſverſe proceſſes of the vertebræ of the back, and therefore it is that luxations are moſt frequently ſeen in this part. The vertebræ of the loins, however, are received into deep cavities, and are tied with much ſtronger ligaments for their ſecurity. Each joint of the vertebræ, except the two uppermoſt, has two centres of motion, one upon the bodies of the vertebræ, when the trunk is bowed forward; and the other at the articulations of the oblique proceſſes, when the body is inclined backwards. From this ſtructure the extenſor muſcles have about twice the lever to act with, and conſequently twice the power to raiſe the trunk into an erect poſture, that they have to carry it beyond that poſture; for then the oblique proceſſes begin to be the centre of motion, and give a like advantage to the flexors. Without this contrivance it would be difficult to keep the body erect, or to recover an erect poſture after the body has been bent forwards.

4. The RIBS are 12 in number on each ſide. The ſeven uppermoſt are called *true* ribs, becauſe their cartilages reach the ſternum; and the five loweſt are named *falſe* ribs. They are articulated to the 12 vertebræ of the back, and all, except the two or three laſt, are articulated to their tranſverſe proceſſes, and the under ſide of the middle ribs are hollow for the paſſage of the intercoſtal veſſels. They defend the parts contained in the breaſt, and when they are drawn upwards, the cavity of the breaſt is enlarged for inſpiration, and vice verſa. The ſubſtance of the ribs is ſpongy, cellular, and only covered with a very thin external lamellated ſurface, which increaſes in thickneſs and ſtrength as it approaches the vertebræ. To the fore end of each rib a long, broad, and ſtrong cartilage is fixed, and reaches thence to the ſternum, or is joined to the cartilage of the rib. This courſe, however, is not in a ſtraight line with the rib; for the cartilages generally make a conſiderable curve, the concave part of which is upwards; therefore, at their inſertion into the ſternum, they make an obtuſe angle above, and an acute one below. Theſe cartilages are of ſuch a length as never to allow the ribs to come to a right angle with the ſpine; but they keep them ſituated ſo obliquely as to make the angle very conſiderably obtuſe, above, till a force exceeding the elaſticity of the cartilage is applied. Theſe cartilages, like all others, are firmer and harder internally than they are on their external ſurface; and ſometimes in old people, all their middle ſubſtance becomes bony, while a thin cartilaginous lamella appears externally. The oſſification, however, begins frequently at the external ſurface.

5. The STERNUM, or *breaſt-bone*, is generally made up of three ſpongy bones, ſometimes more. To this the two ribs are articulated by their cartilages, which ſometimes in robuſt men have moveable joints, ſuch as are ſeen in oxen and other quadrupeds. At the end of the ſternum is the *cartilago enſiformis*, ſo called from its ſhape, (the form of a ſword,) but it is very often double. There is alſo frequently a variety in the form of the cartilages which joins the ribs and ſternum; ſometimes one cartilage ſerving two ribs, and ſometimes a cartilage not being joined to any rib. It is ſeldom that we find fewer than 24 vertebræ in the ſpine, beſides the os ſacrum, but often more. Sometimes there are 13 of the back, with as many ribs on each ſide: ſometimes there exiſt ſix in the loins, and in ſome bodies two ribs from the firſt vertebræ of the loins; but then the tranſverſe proceſſes are generally wanting.

6. The bone called OS INNOMINATUM, or the *un-named bone*, in the adult ſubject, is in young perſons compoſed of three bones; the upper named *os ilium*, the lower and poſterior *os iſchii*, and the anterior *os pubis*. The upper edge of the ilium is called its ſpine, the anterior part of the ſpine its *apex*, and a little lower the *proceſſus innominatus*. The os ilium has two proceſſes, the one named the obtuſe proceſs, and the other the acute. In the centre of theſe bones is the *acetabulum* or ſocket in which the motions of the thigh bones are performed. In the bottom of this ſocket is another cavity, in which lies the lubricating gland which ſupplies this joint with *synovia*. Between the os iſchium and pubis a very large irregular hole is left, which, from its reſemblance to a door or ſhield, has been called *thyroides*. This hole is all, except the niche for the poſterior crural nerve, filled up, in a recent ſubject, with a ſtrong ligamentous membrane, that adheres very firmly to its circumference. From this membrane chiefly the two obturator muſcles external and internal, take their riſe. The great deſign of the hole, beſides rendering the bone lighter, is to allow a ſtrong enough origin to the obturator muſcles, and ſufficient ſpace for lodging their bellies; that there may be no danger of diſturbing the functions of the contained viſcera of the pelvis, by the action of the internal, nor of the external being bruiſed by the thigh bone, eſpecially by its leſſer trochanter.

SECT. V. *Of the* BONES *of the* UPPER EXTREMITY.

The upper extremity conſiſts of the SHOULDER, the ARM, and the HAND. 1. In deſcribing theſe we ſhall begin with the CLAVICULA or *collar-bone*, which is connected at one end to the ſternum, by a looſe cartilage, and at the other to the proceſſus acromion of the ſcapula; at a ſufficient diſtance from the breaſt, to prevent the ſhoulders from coming too near together.

2. The SCAPULA is united to the ſternum by the clavicle. Its chief connection however is to the ribs and ſpine, by means of the ſame muſcles that direct its motions. In ſuch quadrupeds as have no clavicles, it is fixed only by muſcles, whoſe actions give to this bone a great deal of that motion which ſeems to belong to the joint of the ſhoulder. The under ſide of this bone is a little concave, partly to fit the outer ſurface of the ribs on which it moves, and partly to give room for the ſubſcapularis muſcle. On the outſide of the ſcapula riſes a large ſpine, the fore part of which is called *proceſſus acromion* and to which the clavicle is fixed. In men and ſuch quadrupeds as have clavicles, and uſe their fore limbs like arms, this proceſs and ſpine are much larger and more prominent. By this the muſcles are placed farther from the centre of motion, and are thereby able to act with greater effect. Near this proceſs is another called *coracoides*, from whoſe extremity and

with ſimilar advantages, ariſe two muſcles of the arm. This proceſs with the former, and a flat ligament between them both, hinder the os humeri from being diſlocated upwards. The ſide oppoſite to the ſocket is called the baſis of the ſcapula, and the lower edge *coſta inferior* from its figure, which is thick and like a rib to the ſcapula ; but its upper edge being very thin, is improperly ſo called in the human ſubject, although it may be other in many quadrupeds. At the fore part of this edge, cloſe to the coracoid proceſs, is a ſemicircular niche or groove for the paſſage of blood-veſſels, which niche is cloſed above with a ligament and ſometimes with bone. The ſcapula and clavicle are joined by plain ſurfaces tipped with cartilage. The ſcapula is connected to the head, os hyoides, vertebræ, ribs, and arm bone, by muſcles that have one end faſtened to theſe bones, and the other to the ſcapula, ſo as to move it upwards, downwards, backwards, or forwards ; by the quick ſucceſſion of theſe motions, its whole body is carried in a circle. But being alſo often moved as upon an axis perpendicular to its plane, its circumference turns in a circle whoſe centre this axis is. Whichever of theſe motions it performs, it always carries the outer end of the clavicle and the arm along with it.

The **ARM** is divided into two parts, which are articulated with each other at the elbow, viz. The arm properly ſo called and the fore arm. The arm conſiſts of one bone, viz. The os **HUMERI**, which at its upper end or head, where it is joined to the ſcapula, is ſomewhat flat, and much larger than the ſocket which receives it. At its ſuperior part are two proceſſes for the inſertion of the muſcles of the arms, and between theſe proceſſes is a long channel, in which lies the tendon of the biceps cubiti. At is lower end are two conſiderable proceſſes, both formed to give origin to muſcles which move the wriſt and fingers ; and the flexors in theſe parts being much more conſiderable than the extenſors, the inner proceſs from which the flexors ariſe is formed much larger than the outer, from which the extenſors take their origin; between theſe proceſſes is the elbow joint. That part to which is attached the upper end of the radius, is fitted not only for the motion of the elbow, but alſo for the rotatory motion of the radius. The reſt of this joint is made of portions of unequal, but concentric circles, like the ſhanks of quadrupeds ; and this inequality prevents the ulna from diſlocating ſideways, which ſo ſmall a joint with ſo conſiderable a ſhare of motion would otherwiſe be very liable to. Of a like uſe is the little ſinus on the fore part of the humerus, and the large one behind ; the firſt receiving a proceſs of the ulna when the arm is bent, and the other, the olecranon, when the arm is in a ſtate of extenſion.

The fore arm conſiſts of two bones, viz. the Ulna and Radius. The **ULNA**, at its upper end, has one large proceſs called *olecranon*, and a ſmall proceſs on the fore part ; and on one ſide between theſe is alſo a ſmall cavity, which receives the upper end of the radius for its rotatory motion. Down the ſide of this bone, next the radius, is a ſharp edge, from which the ligament ariſes, which connects both together. At the lower end is a proceſs, called *ſtyliformis*, and a round head, which is received into the radius and adapted for the rotatory motion of the elbow.

The upper end of the **RADIUS** is received into the ulna, and joined to the humerus, in a manner chiefly favourable to its rotatory motion ; for the ſtrength of the elbow joint receives but little advantage from the union of theſe two bones. A little below its head is a large tubercle, into which the biceps muſcle is inſerted, and which, in conſequence of this arrangement, turns the cubit in a ſupine poſture, and alſo bends it. At the lower end, which is thicker, is a ſocket to receive the carpus, and at the ſide next the ulna a ſmall one to receive that bone. There is likewiſe a thin edge, into which the tranſverſe ligament, which ariſes from the ulna, is inſerted. By this ligament theſe bones are tied conveniently and firmly together ; for the ulna being chiefly articulated to the os humeri, and the radius to the carpus, a weight at the end would be apt to pull theſe bones aſunder were it not prevented by this ligament.

Each **HAND** has no fewer than twenty ſeven bones, viz. thoſe of the carpus, metacarpus, and fingers. This multiplicity of bones in the hands is eſſential to the various motions we have occaſion to make. If each finger, for inſtance, were compoſed of only *one* bone inſtead of *three*, it would be impoſſible for us to graſp any thing.

I. The **CARPUS** or *wriſt* conſiſts of eight ſmall bones of very irregular forms, but undoubtedly the propereſt that can be. They have all obſcure motions one with another, and with thoſe of the *metacarpus ;* but the motion of thoſe of the firſt rank, or order, with thoſe of the ſecond, is more conſiderable, and is directed by the ſame muſcles which move the carpus on the radius. Thoſe of the upper row are named, from their figures, *os naviculare, os lunare, os cuneiforme,* and *os piſiforme ;* thoſe of the ſecond row, *os trapezium, os magnum, os trapezoides,* and *os unciforme.* All thoſe bones are convex towards the back, and ſlightly concave towards the palm of the hand. Their articulating ſurfaces are covered with cartilages and ſecured by many ſtrong ligaments.

II. The **METACARPUS** conſiſts of four bones which ſuſtain the fingers ; that of the fore-finger having the leaſt motion, and that of the little one the moſt. The other ends of theſe bones have round heads for the articulations of the fingers ; but the other joints of the fingers have double heads and ſockets. The thumb is ſhorter and ſtronger than any of the fingers, becauſe in its actions it has to reſiſt them all. The firſt joint is very ſingular, each bone equally receiving and being received.

III. The regular diſpoſition of the bones of the **FINGERS** into three rows, has made them generally obtain the name of three *phalanges.* All of them have half-round convex ſurfaces, covered with an aponeuroſis, formed by the tendons of the extenſors, lumbricales, and interoſſei, and placed directly backwards, for their greater ſtrength ; and their flat concave part is forwards, for taking hold more ſurely, and for lodging the tendons of the flexor muſcles. The ligaments for keeping down theſe tendons are fixed to the angles that are between the convex and concave ſides.

SECT. VI. *Of the* BONES *of the* LOWER EXTREMITY.

Each of the lower extremities is divided into four parts, viz. the *os Femoris*, or thigh bone ; the *rotula*, or knee bone ; the *leg* and the *foot*. I. The *os Femoris* is the only bone of the thigh. The two thigh bones are the largeſt and ſtrongeſt in the whole body. At its upper end the os femoris has a round head, that is received into the ſocket of the os innominatum. In moſt quadrupeds this head is oblong, and makes a firmer articulation; but that ſhape not allowing of ſo much motion as a rounder head, could not be well adapted to the human ſubject. The two proceſſes near the head of this bone, are called the *greater* and *leſſer trochanters*. Theſe are as evidently formed for the inſertion of muſcles, as the neck of it which lies between them and the head, is formed to make room for thoſe numerous and powerful muſcles which are diſpoſed on the inſide of the thigh; beſides that by projecting outwards, longer levers are ſupplied for thoſe muſcles that are inſerted into its upper and external parts. Between the great trochanter and the neck of this bone, is a large ſinus, into which muſcles are inſerted; and between the two trochanters is a remarkable roughneſs, which begins the linea aſpera, and is deſigned for the ſame uſe. The middle of this bone, for the convenience of the muſcles, is bent forwards; and this would make it ſubject to break backwards, if there were not a ſtrong ridge on the back ſide, which ſtrengthens it conſiderably, and ſerves alſo for the advantageous inſertion of ſeveral muſcles: this ridge is called the *linea aſpera*. At the lower end of the thigh bone are two large heads, called the outer and inner apophyſes. Theſe are ſo contrived, partly from being projected backwards, and partly from their ſhape, as to remove the centre of motion very far behind the axis of the bone, ſo as to give great power to the muſcles that extend this joint, to raiſe the whole weight of the body, though it leſſens the power of the flexors that move the leg only. It is between theſe proceſſes, that the large blood-veſſels deſcend ſecurely to the leg.

II. The ROTULA, PATELLA, or *knee-pan*, is ſeated on the fore part of the knee. It has the appearance of being buried as it were, in the centre of the tendon, through which however it ſoon extends, until the tendinous fibres are loſt, and appear to be converted into bone. When this bone is broken, the original tendinous diſpoſition ſeems to prevail in the part, ſince its broken extremities, unlike thoſe of all other fractured bones, unite with a tendon-like ſubſtance, which is rarely converted into bone, and eſpecially in thoſe caſes where the joint moſt perfectly recovers its motions. The uſe of the rotula is to ſecure the extenſors of the tibia, leſt, paſſing over the joint, they might be too much expoſed to external injuries. It alſo poſſeſſes the advantage mentioned above, of removing the common axis of the extenſors of the tibia farther from the centre of the motion, and thus becomes a moſt convenient medium for thoſe muſcles to unite in, to perform one common action.

III. The LEG is compoſed of two bones; the largeſt called *tibia* and the ſmalleſt *fibula*. The TIBIA, ſo called from its reſemblance to an old muſical pipe or flute, is the long thick triangular bone ſituated at the internal part of the leg, and continued in almoſt a ſtraight line from the thigh bone. At its upper end, are two ſhallow ſockets, which receive the thigh bone, and between theſe, a rough proceſs, to which the crucial ligaments of the knee joint are connected. Near the upper end is a proceſs, into which the ligament or tendon of the patella is inſerted, and at the lower is the proceſs, which forms the inner ancle, and ſecures this bone from diſlocating outwards. Towards its upper end, the tibia is triangular, and even concave on the ſide next the muſcles; but lower, as the muſcles grow leſs and become tendinous, the bone grows rounder; that being upon the whole a ſtronger form. Yet it is by no means ſo ſtrong a bone as that of the thigh, though it bears a greater weight. It is perhaps ſomewhat the more able to do this by being ſtraighter and ſhorter, and bearing the weight of the body in a more perpendicular direction.

The FIBULA is the ſmall long bone, placed on the outſide of the leg, oppoſite to the external angle of the tibia; the ſhape of it is irregularly triangular. The head of the fibula has a ſuperficial circular cavity formed on its inſide, which, in a recent ſubject, is covered with a cartilage; and it is ſo cloſely connected to the tibia by ligaments, as to allow only a ſmall motion backwards. This head is protuberant and rough on its outſide, where a ſtrong round ligament and the muſculus biceps are inſerted; and below the back part of its internal ſide, a tubercle may be remarked, that gives riſe to the ſtrong tendinous part of the ſolæus muſcle. Its upper end is joined to that bone below the joint of the knee, and its lower end ſinks into a ſhallow ſinus of the ſame bone, forming lower down the external ancle. This proceſs, with that of the tibia, ſtrengthens the ancle joint. It is a doubtful point, whether this bone contributes to the ſupport of the body; but, as affording a convenient ſurface for the attachment of muſcles, it is a part of conſiderable importance.

IV. The FOOT conſiſts of the *tarſus*, *metatarſus* and *toes*; and contains in all twenty ſix bones. 1. The TARSUS is compoſed of ſeven bones, viz. the *oſtragalus*, *os calcis*, *os naviculare*, *os cuboides*, and 3 *oſſa cuneiformia*. The ASTRAGALUS is the uppermoſt bone of the foot. It is large and is articulated with both the tibia and the fibula. It ſupports the tibia, and is ſupported by the os calcis, which being projected backwards, makes a long lever for the muſcles to act with, that extend the ancle and raiſe the body upon the toes. Theſe two bones have a conſiderable motion between themſelves, and the aſtragalus alſo with the os naviculare. All the reſt have an obſcure motion one with another, and with the bones of the *metatarſus*: the principal ſhare of theſe motions falling towards the great toe, where lies the greateſt ſtreſs of action. Theſe bones, by yielding in this manner, are leſs liable to be broken; and acting as a kind of ſpring under the leg, render the motions of the body in walking more eaſy and graceful, and the bones to which they give ſupport, leſs ſubject to be fractured in any violent exertion.

The OS CALCIS, is of a very irregular figure, and is the largeſt bone of the foot. Behind, it is formed into a conſiderable tuberoſity called *the heel*; without this tuberoſity, which ſupports us in an erect poſture, and when we walk, we ſhould be apt to fall backwards. On the internal ſurface of this bone, there is a conſiderable ſinuoſity, which affords a paſſage to the tendon of a muſcle: and to the poſterior part of it, a ſtrong tendinous cord, called *tendo achillis*, is attached, which is formed by the tendons of ſeveral muſcles united together. The articulations of all theſe bones are ſecured by ligaments.

The OS NAVICULARE, is ſo called on account of its reſemblance to a little bark. At its poſterior part, which is concave, it receives the aſtragalus ; anteriorly it is articulated with the cuneiform bones, and laterally it is connected with the os CUBOIDES, which forms an irregular cube, and is articulated with the os calcis ; ſupports the two laſt bones of the metatarſus, and joins the third cuneiform bone and the os naviculare.

Each of the OSSA CUNEIFORMIA, reſembles a wedge, and from this ſimilitude their name is derived. They are placed next to the metatarſus, are united to the os naviculare, and ſupport the three firſt metatarſal bones. When theſe ſeven bones of the tarſus are viewed together in the ſkeleton, they appear convex above, where they help to form the upper part of the foot ; and concave underneath, where they form the hollow of the foot, in which the veſſels, tendons, and nerves of it are placed ſecure from preſſure.

II. The METATARSUS is made up of five bones. The firſt of theſe ſupports the great toe and is much larger than the reſt, which nearly reſemble each other in ſize. Theſe bones are articulated by one extremity with the cuneiform bones and the os cuboides, and by the other end with the toes.

III. The TOES, like the fingers, conſiſt of three bones each, except the great toe, which is formed of two. Thoſe of the other four are diſtinguiſhed into three phalanges. In walking, the toes bring the centre of gravity perpendicular to the advanced foot ; and as the ſoles of the foot are naturally concave, we can at pleaſure increaſe this concavity, and form a kind of vault, which adjuſts itſelf to the different inequalities that occur to us in walking ; and which, without this mode of arrangement, would incommode us exceedingly.

There are ſeveral ſmall bones beſides theſe above deſcribed that are met with only in the adult ſkeleton, and in perſons who are advanced in life ; which, from their reſemblance to the ſeeds of the ſeſamum, are called OSSA SESAMOIDEA. They are commonly ſeen at the firſt joint of the great toe, and ſometimes at the joints of the thumb , they are likewiſe found at the lower extremity of the fibula, upon the condyles of the thigh bone, under the os cuboides of the tarſus, and in other parts of the body. Their ſize and number ſeem conſtantly to be increaſed by age and hard labour ; and as they are generally found in ſituations where tendons and ligaments are moſt expoſed to the action of muſcles, they are now generally conſidered as oſſified portions of ligaments or tendons. The upper ſurface of theſe bones is uſually convex, and adherent to the tendon that covers it ; the ſide which is next the joint is ſmooth and flat. Though their formation is accidental, yet they ſeem to be of ſome uſe, by raiſing the tendons farther from the centre of motion, and conſequently increaſing the power of the muſcles. In the great toe and thumb they are likewiſe uſeful, by forming a groove for the flexor tendons.

SECT. VII. *Of the* CARTILAGES, LIGAMENTS, *&c.*

CARTILAGES and LIGAMENTS are ſo neceſſarily connected with the bones, (all bones indeed in their firſt ſtage being only cartilages,) that they are always deſcribed under oſteology. If the moveable bones were not connected and kept firm by ſome ſtrong ſubſtance, they would be luxated at every motion of the joints ; and if their hard rough unequal ſurfaces were to play on each other, their motion would not only be difficult, but the loſs of ſubſtance from attrition would be great. Therefore ligaments are made to obviate the firſt, and cartilages to prevent the other inconveniency. But becauſe ligaments and cartilages turn rigid, inflexible, and rough, unleſs they are kept moiſt, a ſufficient quantity of a proper liquor termed *ſynovia*, is ſupplied for their lubrication. Thoſe parts of a bone, therefore, which is articulated to another bone for motion, are covered or lined with a *cartilage*, as far as it moves upon, or is itſelf moved upon by another bone in any action ; for cartilage being ſmoother and ſofter than bone, renders motion more eaſy than it would otherwiſe be, and prevents the bones from injuring each other by the friction of the joint.

In each articulation of the lower jaw, there is a looſe cartilage, upon which the condyloid proceſs moves on one ſide, while the jaw is thruſt forward. This ſtructure renders the motion of the jaw more firm, as that with intervening cartilages makes it more looſe and voluble. There are alſo cartilages of this kind between the clavicles and the ſternum.

In the joint of the knee are two looſe, almoſt annular cartilages, which being thick at the outer edges, and thin at their inner ones, make the greateſt parts of the two ſockets in this joint. The uſe of theſe cartilages is to make variable ſockets to ſuit the different parts of the lower end of the os femoris ; for none but a round head and a round cavity can ſuit in motion, unleſs the ſhape of one or the other alters ; and it is plainly neceſſary, that this lower end of the os femoris ſhould be flattiſh, and projected backward, to give advantage to the muſcles that extend the tibia, by ſetting the centre of motion backward : which mechaniſm, though it equally leſſens the powers of thoſe muſcles which bend this joint, is yet of great ſervice, becauſe the extending muſcles move this joint under the weight of the whole body, but the flexors only raiſe the legs ; and as no head or ſocket moves ſo eaſily as round ones, there ſeems to be ſome proviſion made againſt the inconvenience of a flattiſh head and cavity, by having the friction made upon two ſurfaces ; the os femoris moving upon the looſe cartilages, and the looſe cartilages, upon the tibia. This contrivance is practiſed by mechanics, where the friction of the joints of any of their machines is great, as between the parts of hook hinges of heavy gates, and between the male and female ſcrews of large vices, where they uſually place a looſe ring.

There are other cartilages which ſerve to give ſhape to parts. Of this ſort are the ciliary cartilages at the edge of the eye-lids, the cartilages of the outer ears, and thoſe which compoſe the noſtrils, which have this particular advantage in thoſe places, that they ſupport and ſhape the parts as well as bones do, and without being liable to be broke.

Bones that are articulated for motion are tied together by very ſtrong ligaments, to prevent their diſlocation, and theſe ligamets alſo ſurround the joints, and preſerve their lubricating mucus. The thickneſs and ſtrength of theſe ligaments are proportioned to the actions of the ſeveral joints, and their lengths are no more than ſufficient to allow a proper degree of motion; but the forms of them are different, according as the actions of the ſeveral joints are to be performed.

To the bones of thoſe limbs that move in every direction, are attached *ligaments* like purſes, which ariſe from or near the edges of the receiving bones, and are inſerted all round the received bones a little below their heads. The beginnings of theſe ligaments, from the edges of the ſockets of the ſcapula and os innominatum, are of a nature almoſt cartilaginous, which ſerves in the ſcapula to make a large ſocket, and ſuch a one as will alter its figures as the bone moves, for the reaſon given with regard to the looſe cartilages of the knee. Indeed the head of the os humeri not being an exact portion of a ſphere, requires ſuch a ſocket, and the hard part of this ligament, in the acetabulum of the os innominatum, makes that cavity deeper than the ſemi-diameter of the ſocket, by which means the articulation is made ſtronger without any hindrance to motion. It will give way to the neck of the os femoris when it preſſes againſt it; and the thigh bone being more diſpoſed to be diſlocated upwards than any other way, the upper ſide of this burſal ligament is made exceedingly ſtrong to prevent ſuch an accident. From the lower edge of the acetabulum or ſocket of the os innominatum ariſes a ligament about an inch long, called *teres* or *rotundum*, which length is neceſſary for that quantity of motion which this joint has in human bodies. It alſo hinders the os femoris from diſlocating upwards, though downwards it will ſuffer it to go far out of the ſocket. This ligament is alſo thought to aſſiſt in preſſing the gland in the bottom of the acetabulum, ſo as compel it to yield its ſecretions.

The ligaments in thoſe joints which admit only of flexion and extenſion, differ from the foregoing in this, that they are much ſhorter and ſtronger at the ſides of the joints, and thinner backward and forward. Beſides theſe ligaments, in the middle and back-part of the joint of the knee, are two very ſtrong ligaments, which ariſe from a proceſs at the end of the tibia. They croſs each other in ſuch a manner as is beſt calculated to ſecure the joint from being diſplaced in any direction. They alſo hinder the extenſors of the tibia from pulling that bone too far forwards, and are ſo connected to the ſemilunar cartilages, as to move them as the joint moves. But beſide theſe, there exiſts in this joint, another ſmall ligament, which ariſes from the os femoris, and ends in the fatty membrane that it ſupports. From this arrangement of parts, it ſeems evident, that the knee cannot be completely diſlocated, without breaking the croſs ligaments.

The bones of the carpus and tarſus are connected together by the ligaments running promiſcuouſly upon their ſurfaces from one to another. At the under ſide of the tarſus, theſe are exceedingly ſtrong, becauſe they ſupport the whole body. There is alſo joined to the carpus a ſtrong ligament, which runs from the fifth bone to the eighth, and the proceſs of the fourth bone. The proper uſe of this is, to bind down the tendons of thoſe muſcles that bring the fingers into a ſtate of flexion.

The proceſſus dentatus of the ſecond vertebra is tied to the ſkull by a ligament, and kept cloſe to the fore part of the firſt vertebra by another in that vertebra, that it may not bruiſe the ſpinal marrow; and when either this ligament or proceſs is broke, it occaſions that ſort of broken neck, which is attended with ſudden death. All the bones of the vertebræ, and every joint that is without motion, and not joined by a ſuture, as the oſſa innominata with each other, and the os ſacrum with the oſſa innominata, are joined by intervening ligaments, or, as they are commonly called, cartilages.

The oſſa innominata are alſo tied by very ſtrong ligaments, which run from the back of the ſpines of the oſſa ilia, to the os ſacrum, and other ligaments which go from the os ſacrum and os coccygis to the acute and obtuſe proceſſes of the oſſa iſchia: theſe ligaments ſerve alſo for origins of muſcles. Towards the great foramen of the oſſa innominata, the acetabulum has a deep notch, acroſs which runs a ligament that completes the ſocket. A ligament ſomewhat like this exiſts alſo between the proceſſes of the ſcapula.—From the edge of the ilium to that of the os pubis, runs a ligament which is contiguous to, and appears to be a part of the tendons of the muſcles of the abdomen. The uſe of this is to cover the iliac veſſels as they deſcend to the thigh.

The ligaments alſo ſupply the place of bones, in ſeveral caſes. Thus the parts in the pelvis are more ſafely ſupported below by ligaments than they could have been by bones. The ligaments placed in the great holes of the oſſa innominata and between the bones of the fore-arm and leg, afford convenient origin to muſcles.—Immoveable bones are firmly connected by them; of which the conjunction of the os ſacrum and innominatum is an example. They afford a ſocket for moveable bones to play in, as we ſee part of the aſtragalus does on the ligament ſtretched from the heel bone to the ſcaphoid.

In every joint, where the bones are faced with a cartilage, to favour a ſliding kind of motion, there are ſmall glands, which ſeparate a mucilaginous fluid, called *synovia*. Theſe are commonly ſituated in the joint, after ſuch a manner as to be gently preſſed, but not deſtroyed by its motion. By this means, when there is the greateſt neceſſity for this liquor, that is, when the moſt frequent motions are performed, the greateſt quantity of it muſt be ſeparated. Theſe glands are ſoft and pappy, but not friable; in ſome of the large joints they are of the conglomerate kind, or a great number of ſmall glandules are wrapt up in one common membrane.—Their excretory ducts are long, and hang looſe, like ſo many fringes, within the articulation; which, by its motion and preſſure, prevents obſtructions in the body of the gland or its excretories; and promotes the return of this liquor, when fit to be taken up by the abſorbent veſſels, which muſt be in the joints, as well as in the other cavities in the body; and, at the ſame time, the preſſure of the excretory duct hinders a ſuperfluous unneceſſary ſecretion, while the fimbriated diſpoſition of theſe excretories does not allow any of the ſecreted liquor to be puſhed back again by theſe canals towards the glands.—Very often theſe fountains of ſlimy liquor appear only as a net-work of veſſels. Frequently they are almoſt concealed by cellular membranes containing the fat, and ſometimes ſmall ſimple mucous folliculi may be ſeen. The different joints have theſe organs in different numbers and ſizes. The conglomerate ones do not vary much, eſpecially as to ſituation, in the ſimilar joints of different bodies; but the others are more uncertain.

EXPLANATION OF PLALE VI. Fig. 1.

Bones of the skeleton.—1. Os frontis. 2. Os bregmatis. 3. Os temporis. 4. Os occipitis. 5. Os malæ. 6. Os maxillæ ſuperioris. 7. Os naſi. 8. Dentes. 9. Os maxillæ inferioris. 10. Tranſverſe proceſſes of the vertebræ of the neck. 11. Clavicula. 12. Proceſſus acromion of the ſcapula. 13. Scapula. 14. Os humeri. 15. Radius. 16. Ulna. 17. Carpus. 18. Metacarpus. 19. Bones of the fingers. 20. Sternum. 21. Cartilago enſiformis. 22. Ribs. 23. Vertebræ of the loins with their tranſverſe proceſſes. 24. Os ilium. 25. Os ſacrum. 26. Os coccygis. 27. Os femoris. 28. Rotula. 29. Fibula. 30. Tibia. 31. Os calcis. 32. Tarſus. 33. Metatarſus. 34. Bones of the toes.

Explanation of the anatomical figures, *pl.* vi. *fig.* 2. which exhibits a View of the external Muscles.—1. Muſculus triceps extenſor cubiti. 2. Deltoides. 3. Teres major. 4. Latiſſimus dorſi. 5. Pectoralis. 6. Obliquus deſcendens abdominis. 7. Rectus abdominis. 8. Sartorius. 9. Rectus femoris. 10. Vaſtus externus. 11. Vaſtus internus. 12. Gaſtrocnemius. 13. Solæus. 14. Tibialis anticus.

PART. II. MYOLOGY.

Sect. I. *Of the* Muscles *in* general.

The Muscles are the organs of motion. The parts uſually included under this name conſiſt of diſtinct portions of fleſh, ſuſceptible of contraction and relaxation; the motions of which, in a natural and healthy ſtate, are ſubject to the will, and for this reaſon, they are called voluntary muſcles. But beſides theſe, there are other parts of the body that owe their power of contraction to their muſcular fibres; thus the heart is of a muſcular texture, forming what is called a hollow muſcle; and the urinary bladder, ſtomach, inteſtines, &c. are enabled to act upon their contents, merely becauſe they are provided with muſcular fibres. Theſe are called involuntary muſcles, becauſe their motions are not dependent on the will. The muſcles of reſpiration, being in ſome meaſure influenced by the will, are ſaid to have a mixed motion.

Muscular Fibres are bundles of reddiſh coloured threads, which perform all the motions viſible in the human body. When many of theſe fibres are collected together, and appear more evidently red, they are called Muscles. In every muſcle we meet with long ſoft threads of *fibres*, ſomewhat elaſtic, or extenſible, and almoſt conſtantly diſpoſed parallel with each other; and theſe, being ſurrounded with a good deal of cellular ſubſtance, are by that faſtened together into little bundles, called *lacertuli;* which are again tied together into larger bundles, by a more looſe cellular net-work, that contains ſome fat; and between theſe we conſtantly perceive membranous partitions and ſtripes of the cellular ſubſtance removing them farther from each other, till at laſt a number of them combined together, either parallel or inclined, are ſurrounded with a more thin and denſe cellular membrane, continuous with that of their partitions; and this being again ſurrounded by a thicker plate of the cellular ſubſtance, parts the whole bundle from the adjacent fleſh, and gives it the denomination of a *single* or *entire muscle*.

In every one of theſe threads there appears a leſſer ſeries of filaments, which, by oblique extremities, are cemented to others of the ſame kind, forming together a large fibre. The generality of the muſcles, but more eſpecially thoſe which are inſerted into the bones, have other fibres fixed to them; but theſe are condenſed into a more ſlender, hard, and ſhining ſubſtance, of a ſilver colour, which has the name of tendon. When the tendinous fibres expand into a broad flat ſurface, they form what is called an *aponeurosis*.

Some anatomiſts have deſcribed the muſcular fibres to be ſtrings of bladders, and have endeavoured to account for muſcular motion by an expanſion made from the influx of blood and animal ſpirits into theſe bladders; but as the muſcles do not increaſe their bulk ſenſibly in contracting, this hypotheſis cannot be correct. Other anatomiſts thought that in this way the muſcles might be contracted by a ſwelling, ſcarce ſenſible, if the bladders were but very ſmall; for, ſay they, ſuppoſing a bladder of any determined bigneſs can raiſe a weight a foot, a hundred bladders, whoſe diameters are each a hundredth part of the former, will raiſe the weight to the ſame height. But the force of inflation, and the ſwelling of all together, will be ten thouſand times leſs, and it will alſo raiſe ten thouſand times leſs weight, which they have not obſerved. Therefore, not one ſuch ſtring of bladders, but ten thouſand muſt be applied to do the ſame thing that the one bladder will do; and they will have the ſame ſwelling; otherwiſe, it would be eaſy to ſhew how to make a perpetuum mobile of almoſt any force.

Muſcles are of two ſorts, *rectilinear* and *penniform*. The rectilinear muscles have their fibres almoſt parallel, in the ſame or near the ſame direction with the axis of the muſcle.—The latter have their fibres joined, in an oblique direction, to a tendon paſſing in or near the axis, or elſe on their outſide. Rectilineal muſcles, if their origins and inſertions lie in little compaſs, are never of any conſiderable thickneſs, unleſs they are very long, becauſe the outer fibres would compreſs the inner ones, and render them almoſt uſeleſs. Every rectilineal muſcle, therefore, whoſe inner fibres are compreſſed by the outer, has its inner fibres longer than its external fibres, in order that they may be capable of an equal quantity of contraction.

The Penniform Muscles, though in a manner free from the inconvenience of one fibre compreſſing another, and though by the obliquity of their fibres nothing is abated of their moment, yet the fibres of the penniform muſcles becoming more and more oblique as they contract their ſtrength decreaſes, and their velocity increaſes, which makes them leſs uniform in their actions than the rectilineal muſcles: For in all caſes, juſt ſo much more weight as rectilineal fibres will raiſe than oblique ones, the oblique will move their weight with ſo much greater velocity than the rectilineal: which is making their moments equal: So that in the ſtructure of an animal, like all mechanic engines, whatever is gained in ſtrength is loſt in velocity, and whatever is gained in velocity is loſt in ſtrength. A penniform muſcle, therefore, is never exerted where a rectilineal muſcle can be uſed; and the caſes in which a rectilineal muſcle cannot be uſed, are where the ſhape of a muſcle is ſuch as that the inward fibres would be too much compreſſed, or where the rectilineal fibres could not have a lever to act with, ſuitable to their quantity of contraction, which is the caſe with all the long muſcles of the fingers and toes.

Every muſcle muſt be inſerted in, or paſs over the centre of motion of the joint it moves, at a diſtance ſuitable to its quantity of contraction, and the quantity of the motion in the joint moved; for if it were to be inſerted too near, the motion of the joint would be performed before the muſcle became completely contracted; if too far off, the muſcle would ceaſe to contract before the whole motion of the joint was performed. And though the quickneſs and quantity of motion in a muſcle will be, *cæteris paribus*, as the length of its fibres; (for if a fibre four inches long will contract one inch in a given time, a fibre eight inches long will contract two inches in the ſame time; and the ſtrength of a muſcle or power to raiſe a weight, *cæteris paribus*, will be as the number of its fibres; for if one fibre will raiſe a grain weight, 20 fibres will raiſe 20 grains:) Yet two muſcles of equal magnitude, the one long, and the other ſhort, will both move the ſame weight with the ſame velocity when applied to a bone; becauſe the levers they act with muſt be as their lengths, and therefore the penniform and ſhort thick muſcles are never appled to a bone for the ſake of ſtrength, nor long fibred muſcles for quickneſs; for whatever is gained by the form of the muſcle, whether ſtrength or quickneſs, muſt be loſt by their inſertions into the bone. Either the muſcles muſt not perform all that they can, or the bones muſt have leſs motion than they are capable of.

In the limbs ſeveral muſcles paſs over two joints, both of which are liable to move at once, with a force proportionable to the levers they act with, upon each joint; but either joint being fixed by an antagoniſt muſcle, the whole force of ſuch muſcles will be exerted upon the other joint; which in that caſe may be moved with a velocity equal to what is in both joints, when theſe muſcles act upon both at once. This mechaniſm is of the utmoſt importance.

The proper uſe and action of any muſcle is that which it has without the neceſſary aſſiſtance of any other muſcle, and what that is, in a muſcle moving a joint, we may always know in any ſituation, and with what force it acts, ceteris paribus, by dropping a line, from the centre of motion of the joint it moves, perpendicular into the axis of the muſcle. But in a joint which admits only of flexion and extenſion, this line muſt alſo be perpendicular to the axis of motion in that joint, and the action of the muſcles will be in the direction of that particular line, and the force with which it acts in any ſituation will be, ceteris paribus, as the length of that perpendicular line.

Every muſcle, ſo far as it is diſtinct, and is moved againſt any part, is covered with a ſmooth cellular membrane to make the friction eaſy; but where the muſcles are externally tendinous, their ſurfaces are generally ſmooth enough to make ſuch a covering unneceſſary. Beſides this membrane there is another, known by the name of *faſcia tendinoſa*, which deſerves to be particularly conſidered. The ſtrong one on the outſide of the thigh, which belongs to the faſcialis and gluteus muſcles, is of great uſe, in raiſing the gluteus farther from the centre of motion of the joint it moves, to increaſe its force. In like manner the faſcia detached from the tendon of the biceps cubiti alters its direction for the ſame purpoſe; but thoſe on the outſide of the tibia and cubit, &c. are only flat tendons from which the fibres of the muſcles ariſe as from the bones. There exiſt alſo in many places tendons between the muſcles, from which each muſcle ariſes in like manner; for the bones themſelves are not ſufficient to give origin to half the fibres of the muſcles that belong to them.

We cannot cloſe this ſection without taking notice of the IRRITABILITY of the muſcles. If a muſcle is pricked or irritated, it immediately contracts. This is called its irritable principle, and this irritability is to be conſidered as the characteriſtic of muſcular fibres, and may ſerve to prove their exiſtence in parts that are too minute to be examined by the eye. This power, which diſpoſes the muſcles to contract when ſtimulated, independent of the will, is ſuppoſed to be inherent in them; and is therefore named by Haller *vis inſita*. This property is not to be confounded with elaſticity, which the membranes and other parts of the body poſſeſs in a greater or leſs degree in common with the muſcles; nor with ſenſibility, for the heart, though the moſt irritable, ſeems to be the leaſt ſenſible of any of the muſcular parts of the body. After a muſcular fibre has contracted, it ſoon returns to a ſtate of relaxation, till it is excited afreſh, and then it contracts and relaxes again. We may likewiſe produce ſuch a contraction, by irritating the nerve leading to a muſcle, although the nerve itſelf is not affected. This principle is found to be greater in ſmall than in large, and in young than in old, animals. In the voluntary muſcles theſe effects of contraction and relaxation of the fleſhy fibres are produced in obedience to the will, by what may be called the *vis nervoſa*, a property that is not to be confounded with the *vis inſita*. The exiſtence of a *vis inſita*, however different from a *vis nervea*, has been called in queſtion by ſeveral, particularly Dr. Monro, who has ſtated very formidable objections againſt it, in his Obſervations on the Nervous Syſtem, of which we ſhall afterwards have occaſion to take particular notice, under NEUROLOGY.

SECT. II. *Of the* PARTICULAR MUSCLES.

To prevent tautology and circumlocution, we have thrown the enumeration and deſcription of the particular muſcles into the form of a table; in which the name, origin, inſertion, and principal uſe of each muſcle, will be ſeen at one glance, deſcribed in few words. It is, however, to be underſtood, that this does not include *all* the muſcles of the body; ſince thoſe belonging to the eyes, internal ear, inteſtinum rectum, &c. are mentioned in other parts of the work. We muſt alſo remark, that though almoſt all the muſcles are in *pairs*, mention is here made only of the muſcles of one ſide.

A TABLE

A TABLE of the MUSCLES, arranged according to their Situation.

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
Muscles ſituated under the integuments of the cranium.	1. Occipitofrontalis.	From the tranſverſe ridge of the os occipitis.	Into the ſkin of the eye-brows.	To pull the ſkin of the head backwards, and to raiſe the eye-brows and ſkin of the forehead.
	2. Corrugator ſupercilii.	From above the joining of the os frontis, os naſi, and os maxillare.	Into the inner part of the occipitofrontalis.	To draw the eyebrows towards each other, and to wrinkle the forehead.
——— of the eye-lids.	1. Orbicularis Palpebrarum.	From around the edge of the orbit.	Into the naſal proceſs of the os maxillare.	To ſhut the eye.
	2. Levator palpebræ ſuperioris.	From the bottom of the orbit, near the optic foramen.	Into the cartilage of the upper eye-lid.	To open the eye.
Muscles of the external ear.	1. Attolens auriculam.	From the tendon of the occipito frontalis near the os temporis.	Into the upper part of the ear.	To raiſe the ear.
	2. Anterior auriculæ.	From near the back part of the zygoma.	Into an eminence behind the helix.	To raiſe this eminence, and to pull it forward.
	3. Retrahentes (s) auriculæ.	From the outer and back part of the root of the maſtoid proceſs.	Into the convex part of the concha.	To ſtretch the concha, and pull the ear backwards.
Muscles of the cartilages of the ear.	1. Tragicus.	From the outer and middle part of the concha, near the tragus.	Into the upper part of the tragus.	To depreſs the concha, and pull the point of the tragus a little outwards.
	2. Anti-tragicus.	From the root of the inner part of the helix.	Into the upper part of the anti-tragus.	To dilate the mouth of the concha.
	3. Tranſverſus-auriculæ.	From the upper part of the concha.	Into the inner part of the helix.	To ſtretch the concha and ſcapha, and likewiſe to pull the parts it is connected with towards each other.
	4. Helicis major.	From the upper, anterior, and acute part of the helix.	Into the cartilage of the helix, a little above the tragus.	To depreſs the upper part of the helix.
	5. Helicis minor.	From the lower and fore part of the helix.	Into the helix, near the fiſſure in its cartilage.	To contract the fiſſure.
——— of the noſe.	1. Compreſſor (T) naris.	From the outer part of the root of the ala naſi.	Into the naſal proceſs of the os maxillare, and anterior extremity of the os naſi.	To ſtraighten the noſtrils, and likewiſe to corrugate the ſkin of the noſe.

(s) *These are three small slender muscles. The inferior one is sometimes wanting.*

(T) *The nose is affected by fibres of the occipito frontalis, and by several muscles of the face; but this pair, the compressores, is the only one that is proper to it.*

	Name.	*Origin.*	*Insertion.*	*Use.*
Muscles of the mouth and lips.	1. Levator labii ſuperioris, alæque naſi.	From the outer part of the orbitar proceſs of the os maxillare, and from the naſal proceſs of that bone, where it joins the os frontis.	Into the upper lip and ala of the noſe.	To draw the upper lip and ſkin of the noſe upwards and outwards.
	2. Levator anguli oris.	From the os maxillare ſuperius, between the orbitar foramen and the firſt dens molaris.	Into the orbicularis oris at the angle of the mouth.	To raiſe the corner of the mouth.
	3. Zygomaticus major.	From the os malæ, near the zygomatic ſuture.	Into the angle of the mouth.	To raiſe the angle of the mouth, and make the cheek prominent as in laughing.
	4. Zygomaticus minor.	Immediately above the origin of the zyg. major.	Into the angle of the mouth.	To raiſe the angle of the mouth, obliquely outwards.
	5. Buccinator.	From the alveoli of the dentes molares in the upper and lower jaws.	Into the angle of the mouth.	To contract the mouth and draw the angle of it outwards and backwards.
	6. Depreſſor labii ſuperioris, alæque naſi.	From the os maxill. ſuper. immediately above the gums of the dentes inciſoros.	Into the root of the ala naſi and upper lip.	To draw the ala naſi and upper lip downwards.
	7. Depreſſor anguli oris.	At the ſide of the chin from the lower edge of the maxilla inferior.	Into the angle of the mouth.	To draw the corner of the mouth downwards.
	8. Depreſſor labii inferioris.	From the lower and anterior part of the maxilla inferior,	Into the under lip.	To draw the under lip downwards & ſomewhat outwards.
	9. Levator labii inferioris.	From near the gums of the inciſores and caninus of the maxilla inferior.	Into the under lip and ſkin of the chin.	To raiſe the under lip and ſkin of the chin.
	10. Orbicularis Oris. (u)			To ſhut the mouth by conſtringing the lips.
Muscles of the lower jaw. - -	1. Temporalis.	From part of the os bregmatis and os frontis; ſquamous part of the os temporis; back part of the os malæ, and the temporal proceſs of the os ſphenoides. (v)	Into the coronoid proceſs of the lower jaw.	To move the lower jaw upwards.

2. Maſſeter

(u) *This muscle is in a great measure, if not wholly, formed by the buccinator, zygomatici, depressores, and other muscles that move the lips. Its fibres surround the mouth like a ring.*

(v) *Some of its fibres likewise have their origin from a strong fascia that covers the muscle and adhers to the bone round the whole circumference of its origin. When we remove this covering, we find the muscle of a semicircular shape with s radiant fibres, converging and forming a strong middle tendon.*

	Name.	*Origin.*	*Insertion.*	*Uſe.*
	2. Maſſeter. (w.)	From the malar proceſs of the os maxillare, and the lower edges of the os malæ, and of the zygomatic proceſs of the os temporis.	Into the baſis of the coronoid proceſs, & that part of the jaw which ſupports that and the condyloid proceſs.	To raiſe and likewiſe to move the jaw a little forwards and backwards.
	3. Pterygoideus internus.	From the inner ſurface of the outer wing of the pterygoid proceſs of the os ſphenoides, and from the proceſs of the os palati that helps to form the pterygoid foſſa.	Into the lower jaw on its inner ſide and near its angle.	To raiſe the lower jaw, and draw it a little to one ſide.
	4. Pterygoideus externus.	From the external ala of the pterygoid proceſs, a ſmall part of the adjacent os maxillare, & a ridge in the temporal proceſs of the os ſphenoides.	Into the fore part of the condyloid proceſs of the lower jaw, and likewiſe of the capſular ligament.	To move the jaw forwards and to the oppoſite ſide (x); and at the ſame time to prevent the ligament of the joint from being pinched.
———ſituated at the fore part of the neck.	1. Latiſſimus colli. (y.)	From the celular membrane covering the pectoral, deltoid, & trapezius muſcles.	Into the ſide of the chin & integuments of the cheek.	To draw the cheeks and ſkin of the face downwards; and when the mouth is ſhut, to draw all that part of the ſkin to which it is connected below the lower jaw upwards.
	2. Maſtoideus (z).	From the upper part of the ſternum, and from the upper and fore part of the clavicle.	Into the maſtoid proceſs, and as far back as the lambdoidal ſuture.	To move the head to one ſide, or when both muſcles act, to bend it forwards.
Muscles ſituated between the trunk and the os hyoides.	1. Omo-hyoideus (A).	From the upper coſta of the ſcapula near its niche; from part of a ligament that extends acroſs this niche, and ſometimes by a few fibres, from the coracoid proceſs.	Into the baſis of the os hyoides.	To draw the os hyoides in an oblique direction downwards.

2. Sterno-

(w) *So called from its use in chewing, its derivation being from the Greek word* maſiſaomai "*to eat.*"

(x) *This happens when the muscle acts singly. When both act, the jaw is brought horizontally forwards.*

(y) *This broad and thin muscular expansion, which is situated immediately under the common integuments, is by Winslow named* muſculus cutaneus.

(z) *This, on account of its two origins, is by Albinus described as two distinct muscles, which he names* ſterno-maiſtoideus, *and* cleido-maſtoideus.

(A) *As this muscle does not always arise from the coracoid process, it seems to have been improperly named* coraco-hyoides *by Douglas and Albinus. Winslow calls it* omo-hyoideus, *on account of its general origin from the scapula.*

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
	2. Sterno-hyoideus.	From the cartilage of the firſt rib, the inner and upper part of the ſternum, and a ſmall part of the clavicle.	Into the baſis of the os hyoides.	To draw the os hyoides downwards.
	3. Hyo-thyreideus.	From part of the baſis and horn of the os hyoides.	Into a rough oblique line at the ſide of the thyroid cartilage.	To raiſe the thyroid cartilage, or depreſs the os hyoides.
	4. Sterno-thyroideus.	From between the cartilages of the 1ſt and 2d ribs, at the upper and inner part of the ſternum.	Immediately under the hyo-thyroideus.	To pull the thyroid cartilage downwards.
	5. Cricothyroideus.	From the anterior part and ſide of the cricoid cartilage.	Into the lower part and inferior horn of the thyroid cartilage	To pull the cricoid cartilage upwards and backwards, or the thyroid forwards and downwards.
——Situated between the os hyoides and lower jaw.	1. Diagaſtricus (B)	From a foſſa at the root of the maſtoid proceſs, and likewiſe from the os hyoides.	Into the lower and anterior part of the chin.	To draw the lower jaw downwards.
	2. Stylo-hyoideus (C)	From the baſis of the ſtyloid proceſs.	Into the ſide and fore part of the os hyoides near its baſe.	To draw the os hyoides obliquely upwards.
	3. Mylo-hyoideus (D)	From the inſide of the lower jaw, between the laſt dens molaris and the chin.	Into the baſis of the os hyoides.	To move the os hyoides to either ſide, forwards or upwards.
	4. Geno-hyoideus (E)	From the inſide of the chin.	Into the baſe of the os hyoides.	To move the os hyoides forwards or upwards.
	5. Genio-gloſſus.	From the inſide of the chin.	Into the tongue and baſis of the os hyoides.	To move the tongue in various directions
	6. Hyo-gloſſus (F)	From the horn, baſis, and appendix of the os hyoides.	Into the tongue laterally.	To draw the tongue downwards and inwards.
	7. Lnigualis.	Laterally from the root of the tongue.	Into the extremity of the tongue.	To ſhorten the tongue and draw it backwards.
	8. Stylo-gloſſus.	From the ſtyloid proceſs, and ſometimes alſo from a ligament that extends thence to the angle of the lower jaw.	Into the ſide of the tongue from the root to near the tip.	To move the tongue backwards and to one ſide.

9. Stylo-

(B) *From* dis "twice," *and* gaſter "the belly" *because it has two fleſhy bellies with a middle tendon.*

(C) *In some subjects we meet with another muscle, which from its having nearly the same origin, insertion, and uſe as this, has been named* ſtylo-hoideus alter.

(D) *So named from its arising near the dentes molares* (muloi) *and its being inserted into the hyoides.*

(E) *From* geneion "*the chin.*"

(F) *From* keras, a horn, *and* gloſſa, "the tongue."

	Name.	*Origin.*	*Insertion.*	*Use.*
	9. Stylo-pharyngæus.	From the baſis of the ſtyloid proceſs.	Into the ſide of the pharynx and poſterior part of the thyroid cartilage.	To raiſe the thyroid cartilage and pharynx, and likewiſe to dilate the latter.
	10. Circumflexus-palati.	From near the bony part of the Euſtachian tube, and from the ſpinous proceſs of the os ſphenoides.	Into the ſemilunar edge of the os palati and the velum pendulum palati (G)	To dilate and draw the velum obliquely downwards.
	11. Levator palati.	From the membranous part of the Euſtachian tube, & the extremity of the os petroſum.	Into the velum pendulum palati.	To pull the velum backwards.
Muscles ſituated about the fauces.	1. Palato-pharyngæus.	From the lower and anterior part of the cartilaginous extremity of the Euſtachian tube (H) the tendinous expanſion of the circumflexus palati; and the velum pendulum palati near the baſis & back part of the uvula.	Into the upper and poſterior part of the thyroid cartilage.	To raiſe the pharynx and thyroid cartilage, or to pull the velum and uvula backwards & downwards.
	2. Conſtrictor iſthmi faucium.	From near the baſis of the tongue laterally.	Into the velum pendulum palati, near the baſis and fore part of the uvula.	To raiſe the tongue and draw the velum towards it. (I.)
	3. Azygos uvulæ.	From the end of the ſuture that unites the oſſa palati.	Into the extremity of the uvula.	To ſhorten the uvula, & bring it forwards and upwards.
Muscles at the back part of the pharynx.	1. Conſtrictor pharyngis ſuperior.	From the cuneiforum proceſs of the occipital bone; the pterygoid proceſs of the os ſphenoides, and from each jaw near the laſt dens molaris. (K)	Into the middle of the pharynx.	To move the pharynx upwards and forwards & to compreſs its upper part.
	2. Conſtrictor pharyngis medius. (L)	From the horn and appendix of the os hyoides, and from the ligament that unites it with the thyroid cartilage.	Into the middle of the proceſſus cuneiformis of the occipital bone, about its middle and before the great foramen.	To draw the os hyoides and pharynx upwards, and to compreſs the latter.

(G) *This muscle in its course forms a round tendon, which, after passing over a kind of hook formed by the inner plate of the pterygoid process of the sphenoid bone, expands into a tendinous membrane.*

(H) *The few fibres that arise from the Eustachian tube are described as a distinct muscle by Albinus, under the name of* ſalpingo-pharyngeus. *They serve to dilate the mouth of the tube.*

(I.) *This muscle, and the palato-pharyngæus, likewise serve to close the passage into the fauces, and to carry the food into the pharynx.*

(K) *The three orders of fibres here mentioned, with a few others derived from the tongue, have given occasion to Douglass to describe them as four distinct muscles, under the names of* cephalo-pharyngæus, mylo-pharyngæus, ptery-pharyngæus, *and* gloſſo-pharyngæus.

(L) *Douglas makes two muscles of this, the* hyo [illegible] yndeſmo-pharyngæus.

ANATOMY.

	Name.	*Origin.*	*Insertion.*	*Use.*
	3. Conſtrictor pharyngis inferior. (m)	From the cricoid and thyroid cartilages.	Into the middle of the pharynx.	To compreſs part of the pharynx.
Muſcles about the glottis. - - -	1. Crico-arytænoideus lateralis.	From the ſide of the cricoid cartilage.	Into the baſis of the arytænoid cartilage laterally.	To open the glottis.
	2. Crico-arytænoideus poſticus.	From the cricoid cartilage poſteriorly.	Into the baſis of the arytenoid cartilage poſteriorly.	To open the glottis.
	3. Arytænoideus obliquus.	From the baſis of one of the arytænoid cartilages.	Near the extremity of the other arytænoid cartilage.	To draw the parts it is connected with towards each other.
	4. Arytænoideus tranſverſus.	From one of the arytænoid cartilages laterally.	Into the other arytænoid cartilage laterally.	To ſhut the glottis.
	5. Thyrec-arytænoideus.	From the poſterior and under part of the thyroid cartilage.	Into the arytænoid cartilage.	To draw the arytænoid cartilage forwards.
	6. Arytæno-epiglottideus.	From the upper part of the arytænoid cartilage laterally.	Into the ſide of the epiglottis.	To move the epiglottis outwards.
	7. Thyreo-epiglottideus.	From the thyroid cartilage.	Into the ſide of the epiglottis.	To pull the epiglottis obliquely downwards. (n)
Muſcles at the fore part of the neck, cloſe to the vertebræ.	1. Rectus capitis internus major.	From the anterior extremities of the tranſverſe proceſſes of the five lowermoſt cervical vertebræ.	In the fore part of the cuneiform proceſs of the os occipitis.	To bend the head forwards.
	2. Rectus capitis internus minor.	From the anterior and upper part of the firſt cervical vertebræ.	Near the baſis of the condyloid proceſs of the os occipitis.	To aſſiſt the laſt deſcribed muſcle.
	3. Rectus capitis lateralis.	From the anterior and upper part of the tranſverſe proceſs of the firſt cervical vertebræ.	Into the os occipitis, oppoſite to the ſtylo-maſtoid foramen.	To move the head to one ſide.
	4. Longus colli.	Within the thorax, laterally from the bodies of the three uppermoſt dorſal vertebræ; from the baſis and fore part of the tranſverſe proceſſes of the firſt and ſecond dorſal vertebræ, and of the laſt cervical vertebræ; and laſtly, from the anterior extremities of the tranſverſe proceſſes of the 6th, 5th, 4th, and 3d cervical vertebræ.	Into the ſecond cervical vertebræ anteriorly.	To pull the neck to one ſide (o).

Muſcles

(m) *The crico-pharyngæus and thyro-pharyngæus of Douglas,*

(n) *When either this or the preceding muscle acts with its fellow, the epiglottis is drawn directly downwards upon the glottis.*

(o) *When both muscles act, the neck is drawn directly forwards.*

	Name.	*Origin.*	*Insertion.*	*Uſe.*
Muscles at the fore part of the abdomen - - - -	1. Obliquus externus.	From the lower edges of the eight inferior ribs, near their cartilages.	Into the linea alba (P), oſſa pubis (Q), and ſpine of the ilium (R).	To compreſs and ſupport the viſcera, aſſiſt in evacuating the feces and urine, draw down the ribs, and bend the trunk forwards, or obliquely to one ſide.
	2. Obliquus internus.	From the ſpinous proceſs of the three lowermoſt lumbar vertebræ, the back part of the os ſacrum, the ſpine of the ilium, and back part of Fallopius's ligament (T).	Into the cartilages of all the falſe ribs, linea alba (S), and fore part of the pubis.	To aſſiſt the obliquus externus.
	3. Tranſverſalis.	From the cartilages of the ſeven inferior ribs; the tranſverſe proceſſes of the laſt dorſal, and four upper lumbar vertebræ; the inner part of Fallopius's ligament and the ſpine of the ilium.	Into the linea alba and cartilago enſiformis.	To compreſs the abdominal viſcera.
	4. Rectus abdominis.	From the upper edge of the pubis and the ſymphyſis pubis.	Into the cartilages of the 5th, 6th, and 7th ribs, and the edge of the cartilago enſiformis (U).	To compreſs the fore part of the abdomen, and to bend the trunk forwards.
	5. Pyramidalis (V).	From the anterior and upper part of the pubis.	Into the linea alba and inner edge of the rectus, commonly about two inches above the pubis.	To aſſiſt the lower portion of the rectus.

Muscles

(P) *The linea alba is that tendinous expansion which reaches from the cartilago ensiformis to the os pubis. It is formed by the interlacement of the tendinous fibres of the oblique and transverse muscles, and on this account some anatomists have considered these as three digastric muscles.*

(Q) *A little above the pubis the tendinous fibres of this muscle separate from each other, so as to form an opening called the* ring *of the obliquus externus, and commonly, though improperly, the ring of the abdominal muscles, there being no such aperture either in the transversalis or obliquus internus. This ring in the male subject affords a passage to the spermatic vessels, and in the female to the round ligament of the uterus.*

(R) *From the anterior and upper spinous process of the ilium, this muscle is stretched tendinous to the os pubis, and thus forms what is called by some* Fallopius's, *and by others* Poupart's ligament. *The blood-vessels pass under it to the thigh.*

(S) *The tendon formed by the upper part of this muscle in its way to the linea alba is divided into two layers. The posterior layer runs under, and the anterior one over, the rectus muscle.*

(T) *From this part it detaches some fibres which extend downwards upon the spermatic chord, and form what is described as the cremaster muscle.*

(U) *The fibres of the rectus are generally divided by three tendinous intersections. The two upper thirds of this muscle passing between the tendinous layers of the obliquus internus, are inclosed as it were in a sheath; but at its lower part we find it immediately contiguous to the peritonæum, the inferior portion of the tendon of the transversalis passing over the rectus, and adhering to the anterior layer of the obliquus internus.*

(V) *This muscle is sometimes wanting.*

	Name.	*Origin.*	*Insertion.*	*Use.*
Muscles at the fore part of the thorax.	1. Pectoralis Major.	From the cartilaginous ends of the 5th and 6th ribs; the ſternum, and anterior part of the clavicle.	Into the upper and inner part of the os humeri. (w)	To draw the arm forwards, or obliquely forwards.
	2. Subclavius.	From the cartilage of the firſt ribs.	Into the under ſurface of the clavicle.	To move the clavicle forwards and downwards, and to aſſiſt in raiſing the firſt rib.
	3. Pectoralis minor. (x)	From the upper edges of the 3d, 4th, and 5th ribs.	Into the coracoid proceſs of the ſcapula.	To move the ſcapula forwards and downwards, or to elevate the ribs.
	4. Serratus Magnus.	From the eight ſuperior ribs.	Into the baſis of the ſcapula.	To bring the ſcapula forwards.
Muscles that concur in forming the thorax, - - -	1. Diaphragma. (y)			
	2. Levatores coſtarum.	From the tranſverſe proceſſes of the laſt cervical, and the eleven upper dorſal vertebræ.	Into the upper ſide of each rib, near its tuberoſity.	To move the ribs upwards and outwards.
	3. Intercoſtales externi.	From the lower edge of each upper rib.	Into the ſuperior edge of each lower rib.	To elevate the ribs.
	4. Intercoſtales interni. (A)			
	5. Sterno-coſtales. (B)	From the cartilago enſiformis, and lower and middle part of the ſternum.	Into the cartilages of the 2d, 3d, 4th, 5th, and 6th ribs.	To depreſs the cartilages of the ribs.
Muscles at the back part of the neck and trunk, - - - -	1. Trapezius, (c) or cucullaris.	From the middle of the os occipitis, and the	Into the poſterior half of the clavicle, part	To move the ſcapula.

ſpinous

(w) *The fibres of this muscle pass towards the axilla in a folding manner, and with those of the latissimus dorsi form the arm-pit.*

(x) *This and some other muscles derive their name of* ſerratus, *from their arising by a number of tendinous or fleshy digitations, resembling the teeth of a saw* (ſerra).

(y) *For a description of the diaphragm, see Part V. Sect. III.*

(A) *The origin, insertion, and use of the internal intercostals, are similar to those of the external. The reader, however, will be pleased to observe, that the intercostales externi occupy the spaces between the ribs only from the spine to their cartilages; from thence to the sternum, their being only a thin membrane, which is spread over the intercostales interni; and that the latter, on the contrary, extend only from the sternum to the angles of each rib.*

The fibres of the external muscles run obliquely forwards; those of the internal obliquely backwards. This difference in the direction of their fibres induced Galen to suppose that they were intended for different uses; that the internal intercostals, for instance, serve to elevate, and the internal ones to depress the ribs. Fallopius seems to have been the first who ventured to dispute the truth of this doctrine, which has since been revived by Boyle, and more lately still by Homberger, whose theoretical arguments on this subject have been clearly refuted by the experiments of Haller.

(B) *These consist of four, and sometimes five distinct muscles on each side. Vesalius, and after him Douglas and Albinus, consider them as forming a single muscle, which, on account of its shape, they name* triangularis. *Verheyen, Winslow, and Haller, more properly describe them as so many separate muscles, which, on account of their origin and insertion, they name* ſterno-coſtales.

(C) *So named by Riolanus, from* trapeza, *on account of its quadrilateral shape. Columbus and others give it the name of* cucullaris, *from its resemblance to a monk's hood.*

Name.	Origin.	Insertion.	Use.
	ſpinous proceſſes of the two inferior cervical, and of all the dorſal vertebræ. (D)	of the acromion, and the ſpine of the ſcapula.	
2. Rhomboideus (E)	From the ſpinous proceſſes of the three lowermoſt cervical, and of all the dorſal vertebræ.	Into the baſis of the ſcapula.	To move the ſcapula upwards and backwards.
3. Latiſſimus dorſi.	From part of the ſpine of the os ilium, the ſpinous proceſſes of the os ſacrum and lumbar vertebræ, & of ſix or eight of the dorſal vertebræ; alſo from the four inferior falſe ribs near their cartilages.	Into the os humeri, at the inner edge of the groove for lodging the long head of the biceps muſcle.	To draw the os humeri downwards and backwards, & to roll it upon its axis.
4. Serratus inferior poſticus.	From the ſpinous proceſſes of the two lowermoſt dorſal, & of three of the lumbar vertebræ.	Into the lower edges of the three or four lowermoſt ribs near their cartilages.	To draw the ribs outwards, downwards, and backwards.
5. Levator ſcapulæ.	From the tranſverſe proceſſes of the four uppermoſt vertebræ colli.	Into the upper angle of the ſcapula.	To move the ſcapula forwards and upwards.
6. Serratus ſuperior Poſticus.	From the lower part of the ligamentum colli, the ſpinous proceſs of the lowermoſt cervical vertebra, and of the two ſuperior dorſal vertebræ.	Into the 2d, 3d, and 4th ribs.	To expand the thorax.
7. Splenius. (F)	From the ſpinous proceſſes of the four or five uppermoſt vertebræ of the back, and of the lowermoſt cervical vertebra.	Into the tranſverſe proceſſes of the two firſt cervical vertebræ, the upper and back part of the maſtoid proceſs, and a ridge on the os occipitis.	To move the head backwards.
8. Complexus. (G)	From the tranſverſe proceſſes of the four or five uppermoſt dorſal, and of the ſix lowermoſt cervical vertebræ.	Into the os occipitis.	To draw the head backwards.

(D) *The tendinous fibres of this muscle, united with those of its fellow in the nape of the neck, from what is called the* ligamentum colli.

(E) *This muscle consists of two distinct portions, which are described as separate muscles by Albinus, under the names of* rhomboideus minor *and* rhomboideus major.

(F.) *According to some writers, this muscle has gotten its name from its resemblance to the spleen; others derive it from* ſplenium ſplint.

(G.) *So named on account of its complicated structure.*

Name.	*Origin.*	*Inſertion.*	*Uſe.*
9. Trachelo-maſtoideus (H)	From the tranſverſe proceſſes of the firſt dorſal vertebra, and four or five of the lowermoſt cervical vertebræ.	Into the maſtoid proceſs.	To draw the head backwards.
10. Rectus capitis poſticus major.	From the ſpinous proceſs of the ſecond cervical vertebra.	Into the os occipitis.	To extend the head and draw it backwards.
11. Rectus capitis poſticus minor.	From the firſt vertebra of the neck.	Into the os occipitis.	To aſſiſt the rectus major.
12. Obliquus ſuperior capitis.	From the tranſverſe proceſs of the firſt cervical vertebra.	Into the os occipitis.	To draw the head backwards.
13. Obliquus inferior capitis.	From the ſpinous proceſs of the ſecond cervical vertebra.	Into the tranſverſe proceſs of the firſt cervical vertebra.	To draw the face towards the ſhoulder, and to move the firſt vertebra upon the ſecond.
14. Sacro-lumbalis. (I)	From the back part of the os ſacrum, ſpine of the ilium, ſpinous proceſſes, and roots of the tranſverſe proceſſes of the vertebræ of the loins.	Into the lower edge of each rib.	To draw the ribs downwards, move the body upon its axis, aſſiſt in erecting the trunk, and turn the neck backwards, or to one ſide.
15. Longiſſimus dorſi. (K)	The ſame as that of the ſacro-lumbalis.	Into the tranſverſe proceſſes of the dorſal vertebræ.	To ſtretch the vertebræ of the back, & keep the trunk erect.
16. Spinalis dorſi.	From the ſpinous proceſſes of the uppermoſt lumbar and lowermoſt dorſal vertebræ.	Into the ſpinous proceſſes of the nine ſuperior dorſal vertebræ.	To extend the vertebræ.
17. Semi-ſpinalis dorſi.	From the tranſverſe proceſſes of the 7th, 8th, 9th, and 10th vertebræ of the back.	Into the ſpinous proceſſes of the four uppermoſt dorſal, & lowermoſt of the cervical vertebræ.	To extend the ſpine obliquely backwards.
18. Multifidus Spinæ. (L)	From the os ſacrum, ilium, oblique and tranſverſe proceſſes of the lumbar ver-	Into the ſpinous proceſſes of the lumbar, dorſal, and ſix of the cervical vertebræ.	To extend the back & draw it backwards, or to one ſide.

19. Semi-

(H.) *So named from its origin from the neck* (traichelos) *and its insertion into the mastoid process.*

(I.) *Several thin fasciculi of fleshy fibres arise from the lower ribs, and terminate in the inner side of this muscle. Steno names them* muſculi ad ſacro lumbalem acceſſorii. *The sacro lumbalis likewise sends off a fleshy slip from its upper part, which by Douglas and Albinus is described as a distinct muscle, under the name of* cervicalis deſcendens. *Morgagni has very properly considered it as a part of the sacro-lumbalis.*

(K.) *At the upper part of this muscle a broad thin layer of fleshy fibres is found crossing, and intimately adhering to it. This portion, which is described by Albinus, under the name of* tranſverſalis cervicis, *may very properly be considered as an appendage to the longissimus dorsi. It arises from the transverse processes of the five or six superior dorsal vertebræ, and is inserted into the transverse processes of the six inferior cervical vertebræ. By means of this appendage the longissimus dorsi may serve to move the neck to one side, or obliquely backwards.*

(L.) *Anatomists in general have unnecessarily multiplied the muscles of the spine. Albinus has the merit of having introduced greater simplicity into this part of myology. Under the name of* multifidus ſpinæ, *he has very properly included those portions of muscular flesh intermixed with tendinous fibres, situated close to the back part of the spine, and which are described by Douglas under the names of* tranſverſus colli, dorſi, lumborum.

Name.	Origin.	Insertion.	Use.
	tebræ, tranſverſe proceſſes of the dorſal, and four of the cervical vertebræ.		
19. Semi-ſpinalis colli.	From the tranſverſe proceſſes of the five or ſix uppermoſt dorſal vertebræ.	Into the ſpinous proceſſes of the 2d, 3d, 4th, 5th, and 6th cervical vertebræ.	To ſtretch the neck obliquely backwards.
20. Scalenus. (M)	From the tranſverſe proceſſes of the five inferior cervical vertebræ.	Into the upper and outer part of the firſt and ſecond ribs.	To move the neck forwards, or to one ſide.
21. Inter-ſpinales. (N)	From the upper part of each of the ſpinous proceſſes of the ſix inferior cervical vertebræ.	Into the under part of each of the ſpinous proceſſes of the vertebræ above.	To draw the ſpinous proceſſes towards each other.
22. Inter tranſverſales. (O)	From the upper part of each of the tranſverſe proceſſes of the vertebræ.	Into the under part of each of the tranſverſe proceſſes of the vertebræ above.	To draw the tranſverſe proceſſes towards each other.
MUSCLES within the cavity of the abdomen, on the anterior and lateral parts of the ſpine.			
1. Pſoas parvus. (P.)	From the ſides & tranſverſe proceſſes of the uppermoſt lumbar vertebræ, and ſometimes of the lowermoſt dorſal vertebræ.	Into the brim of the pelvis, at the junction of the os pubis with the ilium.	To bend the loins forwards.
2. Pſoas magnus.	From the bodies and tranſverſe proceſſes of the laſt dorſal, and all the lumbar vertebræ.	Into the os femoris, a little below the trochanter minor.	To bend the thigh forwards.
3. Iliacus internus.	From the inner lip, hollow part, & edge of the os ilium.	In common with the pſoas magnus.	To aſſiſt the pſoas magnus.
4. Quadratus lumborum. (Q.)	From the poſterior part of the ſpine of the ilium.	Into the tranſverſe proceſſes of the four uppermoſt lumbar vertebræ, the inferior edge of the laſt rib & ſide of the lowermoſt dorſal vertebra.	To ſupport the ſpine, or to draw it to one ſide.

5. Coccygæus.

(M) *The ancients gave it this name from its resemblance to an irregular triangle* (ſkalenos.) *It consists of three fleshy portions. The anterior one affords a passage to the axillary artery, and between this and the middle portion we find the nerves going to the upper extremities. The middle is in part covered by the posterior portion, which is the longest and thinnest of the three.*

(N) *In the generality of anatomical books we find these muscles divided into* inter-ſpinales cervicis, dorſi, *and* lumborum, *but we do not find any such muscles either in the loins or back.*

(O) *These muscles are to be found only in the neck and loins; what have been described as the* inter-tranſverſales dorſi *being rather small tendons than muscles.*

(P) *This and the following pair of muscles derive their name of* pſoas *from* (Pſoa) lumbus, *on account of their situation at the anterior part of the loins.*

(Q) *So called from its shape, which is that of an irregular square.*

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
	5. Coccygæus.	From the poſterior & inner edge of the ſpine of the iſchium.	Into the lower part of the os ſacrum, and almoſt the whole length of the os coccygis laterally.	To draw the os coccygis forwards and inwards. (R)
Muscles on the ſcapula and upper part of the os humeri.	1. Deltoides. (S)	From the clavicle proceſſus acromion, & ſpine of the ſcapula.	Into the anterior and middle part of the os humeri.	To raiſe the arm.
	2. Supra-ſpinatus.	From the baſis, ſpine, and upper coſta of the ſcapula.	Into a large tuberoſity at the head of the os humeri.	To raiſe the arm.
	3. Infra-ſpinatus.	From the baſis & ſpine of the ſcapula.	Into the upper and middle part of the tuberoſity.	To roll the os humeri outwards.
	4. Teres minor. (T)	From the inferior coſta of the ſcapula.	Into the lower part of the tuberoſity.	To aſſiſt the infra ſpinatus.
	5. Teres major.	From the inferior angle, & inferior coſta of the ſcapula.	Into the ridge at the inner ſide of the groove formed for the long head of the biceps.	To aſſiſt in the rotatory motion of the arm.
	6. Subſcapularis.	From the baſis, ſuperior & inferior coſtæ of the ſcapula.	Into the upper part of a ſmall tuberoſity at the head of the os humeri.	To roll the arm inwards.
	7. Coraco brachialis. (U)	From the coracoid proceſs of the ſcapula.	Into the middle & inner ſide of the os humeri.	To roll the arm forwards and upwards.
Muscles on the os humeri, - - - -	1. Biceps flexor cubiti.	By two heads, one from the coracoid proceſs, and the other, or long head, from the upper and outer edge of the glenoid cavity of the ſcapula.	Into the tuberoſity at the upper end of the radius.	To bend the fore-arm.
	2. Brachialis internus.	From the os humeri, below, and at each ſide of the tendon of the deltoides.	Into a ſmall tuberoſity at the fore part of the coronoid proceſs of the ulna.	To aſſiſt in bending the fore-arm.
	3. Triceps extenſor cubiti.	By three heads: the firſt, from the inferior coſta of the ſcapula; the ſecond, from the upper and outer part of the os humeri; and the third, from the back part of that bone.	Into the upper and outer part of the olecranon.	To extend the fore-arm.

(R) *Some of the fibres of this muscle are united with thoſe of the levator ani, ſo that it aſſiſts in cloſing the lower part of the pelvis.*

(S) *So named from its ſuppoſed reſemblance to the Greek* Δ *reverſed.*

(T) *This and the following pair are called* teres, *from their being of a long and round ſhape.*

(U) *This muscle affords a paſſage to the muſculo-cutaneous nerve.*

	Name.	*Origin.*	*Insertion.*	*Use.*
MUSCLES on the fore-arm, - - - - -	1. Supinator longus.	From the outer ridge and anterior ſurface of the os humeri, a little above its outer condyle.	Into the radius near its ſtyloid proceſs.	To aſſiſt in turning the palm of the hand upwards.
	2. Extenſor carpi radialis longus.	Immediately below the origin of the ſupinator longus.	Into the upper part of the metacarpal bone of the middle finger.	To extend the wriſt.
	3. Extenſor carpi radialis brevis.	From the outer and lower part of the outer condyle of the os humeri, and the upper part of the radius.	Into the upper part of the metacarpal bone of the middle finger.	To aſſiſt the extenſor longus.
	4. Extenſor digitorum communis.	From the outer condyle of the os humeri.	Into the back part of all the bones of the four fingers.	To extend the fingers.
	5. Extenſor minimi digiti.	From the outer condyle of the os humeri.	Into the bones of the little finger.	To extend the little finger.
	6. Extenſor carpi ulnaris.	From the outer condyle of the os humeri.	Into the metacarpal bone of the little finger.	To aſſiſt in extending the wriſt.
	7. Anconæus. (v)	From the outer condyle of the os humeri.	Into the outer edge of the ulna.	To extend the fore arm.
	8. Flexor carpi ulnaris.	From the inner condyle of the os humeri, and anterior edge of the olecranon. (w)	Into the os piſiforme.	To aſſiſt in bending the hand.
	9. Palmaris longus.	From the inner condyle of the os humeri.	Into the internal annular ligament, and aponeuroſis palmaris. (x)	To bend the hand.
	10. Flexor carpi radialis.	From the inner condyle of the os humeri.	Into the metacarpal bone of the fore finger.	To bend the hand.
	11. Pronator radii teres.	From the outer condyle of the os humeri, and coronoid proceſs of the ulna.	Into the anterior and convex edge of the radius, near its middle.	To roll the hand inwards.
	12. Flexor ſublimis perforatus. (y)	From the inner condyle of the os humeri, inner edge of the coronoid proceſs of the ulna, and upper and anterior part of the radius.	Into the ſecond bone of each finger.	To bend the ſecond joint of the fingers.

(v) *So called from* ankōn, cubitus.

(w) *Between the two origins of this muscle we find the ulnar-nerve going to the fore arm.*

(x) *The aponeurosis palmaris is a tendinous membrane that extends over the palm of the hand. Some anatomists have supposed it to be a production of the tendon of this muscle, but without sufficient grounds; for in some subjects we find the palmaris longus inserted wholly into the annular ligament, so as to be perfectly distinct from this aponeurosis; and it now and then happens, that no palmaris longus is to be found, whereas this expansion is never deficient.*

(y) *This muscle is named* perforatus, *on account of the four tendons in which it terminates, being perforated by those of another muscle, the perforans.*

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
	13. Supinator radii brevis.	From the outer condyle of the os humeri, and poſterior ſurface and outer edge of the ulna.	Into the anterior, inner, and upper part of the radius.	To roll the radius outwards.
	14. Abductor pollicis longus.	From the middle and back part of the ulna, interoſſeous ligament, and radius.	By two tendons into the os trapezium, and firſt bone of the thumb.	To ſtretch the firſt bone of the thumb outwards.
	15. Extenſor minor pollicis.	From the back part of the ulna, and interoſſeous ligament and radius.	Into the convex part of the ſecond bone of the thumb.	To extend the ſecond bone of the thumb obliquely outwards.
	16. Extenſor major pollicis.	From the back of the ulna and interoſſeous ligament.	Into the third and laſt bone of the thumb.	To ſtretch the thumb obliquely backwards.
	17. Indicator.	From the middle of the ulna.	Into the metacarpal bone of the fore finger.	To extend the fore finger.
	18. Flexor profundus perforans.	From the upper and fore part of the ulna, and interoſſeous ligament.	Into the fore part of the laſt bone of each of the fingers.	To bend the laſt joint of the fingers.
	19. Flexor longus pollicis.	From the upper and fore part of the radius.	Into the laſt joint of the thumb.	To bend the laſt joint of the thumb.
	20. Pronator radii quadratus.	From the inner and lower part of the ulna.	Into the radius, oppoſite to its origin.	To roll the radius inwards, and of courſe to aſſiſt in the pronation of the hand.
Muscles on the hand	1. Lumbricales. (z)	From the tendons of the perforans.	Into the tendons of the extenſor digitorum communis.	To bend the firſt, & to extend the two laſt joints of the fingers. (A)
	2. Abductor brevis pollicis.	From the fore part of the internal annular ligament, os ſcaphoides, & one of the tendons of the abductor longus pollicis.	Into the outer ſide of the ſecond bone of the thumb, near its root.	To move the thumb from the fingers.
	3. Opponens pollicis.	From the inner & anterior part of the internal annular ligament, and from the os ſcaphoides.	Into the firſt bone of the thumb.	To move the thumb inwards, and to turn it upon its axis.
	4. Flexor brevis pollicis.	From the os trapezoides, internal annular ligament, os magnum, & os unciforme.	Into the oſſa ſeſamoidea and ſecond bone of the thumb.	To bend the ſecond joint of the thumb.
	5. Abductor pollicis.	From the metacarpal bone of the middle finger.	Into the baſis of the ſecond bone of the thumb.	To move the thumb towards the fingers.
	6. Abductor indicis.	From the inner ſide of the firſt bone of the thumb, and from the os trapezium.	Into the firſt bone of the fore finger poſteriorly.	To move the fore finger towards the thumb.

7. Palmaris

(z) *So named from their being shaped somewhat like the lumbricus or earth-worm.*

(A) *Fallopius was the first who remarked the two opposite uses of this muscle. Their extending power is owing to their connection with the extensor communis.*

Name.	*Origin.*	*Insertion.*	*Use.*
7. Palmaris brevis.	From the internal annular ligament, and aponeuroſis palmaris.	Into the os piſiforme, and the ſkin covering the abductor minimi digiti.	To contract the palm of the hand.
8. Abductor minimi digiti.	From the internal annular ligament and os piſiforme.	Into the ſide of the firſt bone of the little finger.	To draw the little finger from the reſt.
9. Flexor parvus minimi digiti.	From the os unciforme and internal annular ligament.	Into the firſt bone of of the little finger.	To bend the little finger.
10. Abductor metacarpi minimi digiti.	From the os unciforme and internal annular ligament.	Into the metacarpal bone of the little finger.	To move that bone towards the reſt.
11. Interroſſei interni.	Situated between the metacarpal bones.	Into the roots of the fingers.	To extend the fingers and move them towards the thumb.(B)
12. Interoſſei externi.	Situated between the metacarpal bones on the back of the hand.	Into the roots of the fingers.	To extend the fingers; but the firſt draws the middle finger inwards, the ſecond draws it outwards, & the third draws the ring finger inwards.
MUSCLES at the back part of the pelvis, and upper part of the thigh. - - -			
1. Glutæus (C) maximus.	From the ſpine of the ilium, poſterior ſacro-iſchiatic ligaments, os ſacrum, and os coccygis.	Into the upper part of the *linea aspera* of the os femoris.	To extend the thigh and draw it outwards.
2. Glutæus medius.	From the ſpine and ſuperior ſurface of the ilium.	Into the outer & back part of the great trochanter of the os femoris.	To draw the thigh outwards and a little backwards, & when it is bended, to roll it.
3. Glutæus minimus.	From the outer ſurface of the ilium and the border of its great niche.	Into the upper and anterior part of the great trochanter.	To aſſiſt the former.
4. Pyriformis. (D)	From the anterior part of the os ſacrum.	Into a cavity at the root of the trochanter major.	To roll the thigh outwards.
5. Gemini. (E)	By two portions, one from the outer ſurface of the ſpine of the iſchium; the other from the tuberoſity of the iſchium and poſterior ſacro-iſchiatic ligament.	Into the ſame cavity as the pyriformis.	To roll the thigh outwards, and likewiſe to confine the tendon of the obturator internus, when the latter is in action.
6. Obturator internus.	From the ſuperior half of the inner border of the foramen thyroideum.	Into the ſame cavity with the former.	To roll the thigh outwards.

7. Quadratus

(B) *The third interosseus internus (for there are four of the externi and three of the interni) differs from the rest in drawing the middle finger from the thumb.*

(C) *From* gloutos, nates.

(D) *So named from its pear-like shape.*

(E) *The two portions of this muscle having been described as two distinct muscles by some anatomists, have occasioned it to be named* gemini. *The tendon of the obturator internus runs between these two portions.*

	Name.	*Origin.*	*Insertion.*	*Uſe.*
	7. Quadratus (F) femoris.	From the tuberoſity of the iſchium.	Into a ridge between the trochanter major and trochanter minor.	To move the thigh outwards.
Muscles on the thigh (G) - - - - -	1. Biceps flexor cruris.	By two heads; one from the tuberoſity of the iſchium, the other from the linea aſpera near the inſertion of the glutæus maximus.	Into the upper and back part of the fibula. (H)	To bend the leg.
	2. Semi-tendinoſus.	From the tuberoſity of the iſchium.	Into the upper & inner part of the tibia.	To bend and draw the leg inwards.
	3. Semi-membranoſus. (I)	From the tuberoſity of the iſchium.	Into the upper and back part of the head of the tibia.	To bend the leg.
	4. Tenſor vaginæ femoris.	From the ſuperior and anterior ſpinous proceſs of the ilium.	Into the inner ſide of the faſcia lata, which covers the outſide of the thigh.	To ſtretch the faſcia.
	5. Sartorius.	From the ſuperior and anterior ſpinous proceſs of the ilium.	Into the upper and inner part of the tibia.	To bend the leg inwards. (K)
	6. Rectus.	By two tendons; one from the anterior & inferior ſpinous proceſs of the ilium; the other from the poſterior edge of the cotyloid cavity.	Into the upper & forepart of the patella.	To extend the leg.
	7. Gracilis.	From the fore-part of the iſchium and pubis.	Into the upper and inner part of the tibia.	To bend the leg.
	8. Vaſtus externus (L)	From the anterior and lower part of the great trochanter, & the outer edge of the linea aſpera.	To the upper and outer part of the patella.	To extend the leg.
	9. Vaſtus internus.	From the inner edge of the linea aſpera, beginning between the fore-part of the os femoris and the root of the leſſer trochanter.	Into the upper and inner part of the patella.	To extend the leg.

10. Cruræus

(F) *This muscle is not of the square shape its name would seem to indicate.*

(G) *The muscles of the leg and thigh are covered by a broad tendinous membrane called* faſcia lata, *that* [illegible] *them in the manner of a sheath. It is sent from the tendons of the glutæi and other muscles, and dipping down* [illegible] *the muscles it covers, adheres to the linea aspera, and spreading over the joint of the knee, gradually disappears* [illegible] *leg. It is thickest on the inside of the thigh.*

(H) *The tendon of this muscle forms the* outer ham-ſtring.

(I) *So named on account of its origin, which is by a broad flat tendon three inches long.*

(K) *Spigelius was the first who gave this the name of* ſartorius, *or the taylor's muscle, from its use in crossing the legs.*

(L) *The vastus externus, vastus internus, and cruræus, are so intimately connected with each other, that some anatomists have been induced to consider them as* a triceps, *or single muscle with three heads.*

	Name.	*Origin.*	*Insertion.*	*Use.*
	10. Cruræus. (M)	From the outer & anterior part of the leſſer trochanter.	Into the upper part of the patella.	To extend the leg.
	11. Pectinalis.	From the anterior edge of the os pubis, or pectinis, as it is ſometimes called.	Into the upper and fore-part of the linea aſpera.	To draw the thigh inwards, upwards, and to roll it a little outwards.
	12. Adductor longus femoris. (N)	From the upper and fore part of the os pubis.	Near the middle and back part of the linea aſpera.	To draw the thigh inwards, upwards, and to roll it a little outwards.
	13. Adductor brevis femoris.	From the fore part of the ramus of the os pubis.	Into the inner and upper part of the linea aſpera.	
	14. Adductor magnus femoris.	From the lower & fore part of the ramus of the os pubis.	Into the whole length of the linea aſpera.	
	15. Obturator externus.	From part of the obturator ligament, & the inner half of the circumference of the foramen thyroideum.	Into the os femoris near the root of the great trochanter.	To move the thigh outwards in an oblique direction, and likewiſe to bend & draw it inwards.
MUSCLES on the leg.	1. Gaſtrocnemius (O) externus.	By two heads; one from the inner condyle, the other from the outer condyle of the os femoris.	By a great round tendon, common to this and the following muſcle.	To extend the foot.
	2. Gaſtrocnemius (P) internus.	By the two heads; one from the back part of the head of the fibula, the other from the upper and back part of the tibia.	By a large tendon (the *tendo achillis*) common to this and the former muſcle, into the lower and back part of the os calcis.	To extend the foot.
	3. Plantaris (Q)	From the upper and poſterior part of the outer condyle of the os femoris.	Into the inſide of the back part of the os calcis.	To aſſiſt in extending the foot.
	4. Popliteus. (R)	From the outer condyle of the thigh.	Into the upper and inner part of the tibia.	To aſſiſt in bending the leg and rolling it inwards.

(M) *Under the cruræus we sometimes meet with two small muscles, to which Albinus has given the name of* ſub-cruræi. *They terminate on each side of the patella, and prevent the capsular ligament from being pinched. When they are wanting, which is very often the case, some of the fibres of the cruræus are found adhering to the capsula.*

(N) *This and the two following muscles have been usually, but improperly, considered as forming a single muscle with three heads, and on that account named* triceps femoris.

(O) Gaſtroknemia, "*the calf of the leg.*"

(P) *This muscle is by some anatomists named* ſoleus, *on account of its being shaped like the sole fish.*

(Q) *This muscle has got the name of* plantaris, *from its being supposed to furnish the aponeurosis that covers the sole of the foot; but it does not in the least contribute to the formation of that tendinous expansion.*

(R) *So called on account of its situation at the ham* (poples.)

	Name.	*Origin.*	*Insertion.*	*Use.*
	5. Flexor longus digitorum pedis. (s)	From the upper and inner part of the tibia.	By four tendons, which after paſſing thro' the perforations in thoſe of the flexor digitorum brevis, are inſerted into the laſt bone of all the toes, except the great toe.	To bend the laſt joint of the toe.
	6. Flexor longus pollicis pedis.	From the back part, & a little below the head of the fibula.	Into the laſt bone of the great toe.	To bend the great toe.
	7. Tibialis poſticus.	From the back part & outer edge of the tibia, and likewiſe from the interoſſeous ligament & adjacent part of the fibula.	Into the inner and upper part of the os naviculare and ſide of the os cuneiforme medium.	To move the foot inwards.
	8. Peroneus longus.	From the outer ſide of the head of the tibia, and alſo from the upper, anterior, and outer part of the *perone* or fibula, to which it adheres for a conſiderable way down.	Into the metatarſal bone of the great toe.	To move the foot outwards.
	9. Peroneus brevis.	From the outer and fore-part of the fibula.	Into the metatarſal bone of the little toe.	To aſſiſt the laſt deſcribed muſcle.
	10. Extenſor longus digitorum pedis.	From the upper, outer, and fore part of the tibia, interoſſeous ligament, and inner edge of the fibula.	By four tendons into the firſt joint of the ſmaller toes.	To extend the toes.
	11. Peroneus tertius.	From the fore-part of the lower half of the fibula, and from the interoſſeous ligament.	Into the metatarſal bone of the little toe.	To bend the foot.
	12. Tibialis anticus.	From the upper and fore-part of the tibia.	Into the os cuneiforme internum.	To bend the foot.
	13. Extenſor proprius pollicis pedis.	From the upper and fore part of the tibia.	Into the convex ſurface of the bones of the great toe.	To extend the great toe.
MUSCLES on the foot.	1. Extenſor brevis digitorum pedis.	From the upper and anterior part of the os calcis.	By four tendons; one of which joins the tendon of the externus longus pollicis, and the other three the tendons of the extenſor digitorum longus.	To extend the toes.

2. Flexor

(s) *This muscle, about the middle of the foot, unites with a fleshy mass, which, from its having first been described by Sylvius, is usually called* maſſa carnea JACOBI SYLVII.

Name.	*Origin.*	*Insertion.*	*Uſe.*
2. Flexor brevis digitorum pedis.	From the lower part of the os calcis.	By four tendons, which after affording a paſſage to thoſe of the flexor longus, are inſerted into the ſecond phalanx of each of the ſmall toes.	To bend the ſecond joint of the toes.
3. Abductor pollicis pedis.	From the inner and lower part of the os calcis.	Into the firſt joint of the great toe.	To move the great toe from the other toes.
4. Abductor minimi digiti.	From the outer tubercle of the os calcis, the root of the metatarſal bone of the little toe, and alſo from the aponeuroſis plantaris.	Into the outer ſide of the firſt joint of the little toe.	To draw the little toe outwards.
5. Lumbricales pedis.	From the tendons of the flexor longus digitorum pedis.	Into the tendinous expanſion at the upper part of the toes.	To draw the toes inwards.
6. Flexor brevis pollicis pedis.	From the interior and anterior part of the os calcis, and alſo from the inferior part of the os cuneiforme externum.	By two tendons into the firſt joint of the great toe.	To bend the firſt joint of the great toe.
7. Adductor pollicis pedis.	From near the roots of the metatarſal bones of the 2d, 3d, and 4th toes.	Into the outer os ſeſamoideum, or firſt joint of the great toe.	To draw the great toe nearer to the reſt, & alſo to bend it.
8. Tranſverſales pedis.	From the outer & under part of the anterior end of the metatarſal bone of the little toe.	Into the inner os ſeſamoideum, and anterior end of the metatarſal bone of the great toe.	To contract the foot.
9. Flexor brevis minimi digiti pedis.	From the baſis of the metatarſal bone of the little toe.	Into the firſt joint of the little toe.	To bend the little toe.
10. Interoſſei pedis interni. (T)	Situated between the metarſal bone.		
Interoſſei externi. (U)			

EXPLANATION OF PLATES VI, VII, AND VIII.

FARTHER EXPLANATION OF PLATE VI.

FIG. 3. MUSCLES *of the* HEAD, FACE, NECK, &c. 1. Muſculus frontalis. 2. Temporalis. 3. Orbicularis. 4. The parotid gland, with its duct, which paſſes through the buccinator. 5. Maſtoideus. 6. Zygomaticus. 7. Elevator labii ſuperioris proprius. 8. Elevator labiorum communis. 9. Depreſſor labiorum communis. 10. Sphincter oris. 11. Depreſſor labii inferioris proprius. 12. Buccinator. 13. Sterno-hyoidei. 14. Coraco-hyoideus. 15. Maſtoideus. 16. Trapezius. 17. Pectoralis. 18. Deltoides.

FIG. 4. *A* POSTERIOR VIEW *of the* MUSCLES *of the* TRUNK. 1. Trapezius. 2. Deltoides. 3. Infra-ſpinatus ſcapulæ. 4. Teres major. 5. Rhomboides. 6. Latiſſimus dorſi. 7. Glutæi. 8. Obliquus deſcendens abdominis.

FIG. 5. *An* ANTERIOR VIEW *of the* VISCERA *in situ.* 1. Trachea. 2. The internal jugular vein. 3. The ſubclavian vein. 4. Cava deſcendens. 5. The right auricle of the heart. 6. The right ventricle. 7. Part of the left ventricle. 8. Aorta aſcendens. 9. Arteria pulmonalis. 10. The right lobe of the lungs, part of which is cut off to ſhew

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(T) *The interossei interni are three in number; their use is to draw the smaller toes towards the great toe.*

(U) *The interossei externi are four in number; the first serves to move the fore toe towards the great toe; the rest move the toes outwards. All the interossei assist in extending the toes.*

ſhew the great blood-veſſels. 11. The left lobe of the lungs. 12. The diaphragm. 13. The liver. 14. The ligamentum rotundum. 15. The gall-bladder. 16. The ſtomach, preſſed by the liver towards the left ſide. 17. The ſmall inteſtines. 18. The ſpleen.

FIG. 6. *A* VIEW *of the* POSTERIOR ABDOMINAL VISCERA. 1. The under ſide of the liver. 2. Ligamentum rotundum. 3. The gall-bladder. 4. The pancreas. 5. The ſpleen. 6. The kidney. 7. Aorta aſcendens. 8. Vena cava aſcendens. 9. The emulgent vein. 10. A probe under the ſpermatic veſſels and the arteria meſenterica inferior, and over the ureters. 11. The ureter. 12. The iliac veſſels. 13. The rectum inteſtinum. 14. The bladder of urine.

EXPLANATION OF PLATE VII.

MUSCLES *of the* UPPER EXTREMITY. 1. Muſculus deltoides. 2. Pectoralis. 3. Biceps flexor cubiti. 4. Triceps extenſor cubiti. 5. The faſcia tendinoſa of the biceps muſcle. 6. Supinator radii longus. 7. Flexor carpi radialis. 8. Brachiæus internus. 9. Extenſores carpi radiales. 10. Extenſor communis digitorum. 11. Extenſor carpi ulnaris. 12. Flexor carpi ulnaris. 13. Anconæus. 14. Extenſor pollicis primus. 15. Extenſor pollicis ſecundus.

MUSCLES *of the* LOWER EXTREMITY. 1. Membranoſus. 2. Rectus femoris. 3. Vaſtus internus. 4. Vaſtus externus. 5. Sartorius. 6. Pectinæus. 7. Gaſtrocnemius. 8. Solæus. 9. Tibialis anticus. 10. Extenſores digitorum. 11. Glutæus. 12. Biceps femoris. 13. Semitendinoſus. 14. Semimembranoſus. 15. Gaſtrocnemius.

ARTERIES *of the* UPPER EXTREMITY. 1. The humeral artery. 2. Cubitalis ſuperior. 3. Cubitalis inferior, which ends in the hand and the fingers, and communicates with the cubitalis ſuperior, under the muſcles of the thumb. 4. The place where the cubitalis media is given off.

FIG. 1. *Represents the* SECOND LAYER *of the* MUSCLES *on the* BACK PART *of the* BODY.

HEAD *and* NECK. *a*, Temporalis; its tendon is ſeen paſſing below the zygoma. *b*, Maſſeter. *c*, Splenius capitis et colli. *d*, Portion of the complexus. *e*, Levator ſcapulæ, ſeu muſculus patientiæ.

TRUNK. *a*, Rhomboides major. *b*, Rhomboides minor: and immediately above it the upper edge of the ſerratus poſticus ſuperior is ſeen. *c*, The ſerratus poſticus ſuperior on the right ſide. *d*. Serratus poſticus inferior. *e*, Part of the ſpinalis dorſi. *f*, Part of the longiſſimus dorſi. *g*, Part of the ſacrolumbalis. *h*, Serratus magnus. *i*, The broad tendon, by which the latiſſimus dorſi begins, and from which the tendon of the ſerratus poſticus inferior is inſeparable. *k*, Part of the obliquus internus aſcendens abdominis. *l*, The ſphincter ani, fixed to the point of the coccygis; at the ſide of which the coccygæus, and a portion of the levator ani are ſeen, and lower down, oppoſite to *l*, part of the tranſverſalis penis.

SUPERIOR EXTREMITY. *a*, Supra-ſpinatus. *b* Infra-ſpinatus. *c*, Teres minor. *d*, Teres major. *e*, Triceps extenſor cubiti. *f*, Its head, called longus. *g*, The brevis. *h*, A ſmall portion of the third head, named Brachialis Externus. *i*, The tendon of the triceps, inſerted into the olecranon. *k*, Part of the brachialis internus. And *l*, conæus, which ſeems to be continued from that part of the brachialis externus immediately above it. *m*, Extenſor carpi radialis longior; and beneath it the brevior; both are ſeen at the wriſt, inſerted into the metacarpal bones of the fore and middle fingers. *n*, Flexor carpi ulnaris. *o*, Part of the ſupinator radii brevis. *p*, Extenſor oſſis metacarpi pollicis manus. *q*, Extenſor primi internodii pollicis manus. *r*, Extenſor ſecundi internodii pollicis manus. *s*, Indicator, inſerted into the root of the firſt joint of the fore finger. *t*, One of the three external interoſſei manus. The other two are diſtinctly ſeen without letters. *u*, One of the tendons of the extenſors of the fingers cut; and the ſame is ſeen in each of the other three fingers, joining with the tendons and aponeuroſes of the interoſſei and lumbricales, and ſpread upon the back of the fingers.

On the right hand, part of the flexors of the fingers, the abductor pollicis, and minimi digiti, are ſeen.

INFERIOR EXTREMITY. *a*, Glutæus medius. *b*, Pyriformis. *c*, The two muſcles called Gemini, between which the tendon of the obturator internus paſſes over the tuberoſity of the os iſchium; and its fleſhy belly is ſeen within the pelvis, partly covered by the coccygæus and levator ani. *d*, Quadratus femoris. *e*, Vaſtus externus. *f*, *f*, Parts of the triceps magnus. *g*, Long head of the triceps flexer cruris; and beneath it part of the ſhort head is ſeen. *h*. Semitendinoſus, and beneath it parts of the ſemimembranoſus are ſeen on each ſide of it. *i*, Gracilis. *k*, A ſmall portion of the vaſtus internus. *l*, Popliteus. *m*, The fleſhy belly of the plantaris; and its long ſlendor tendon is ſeen paſſing over the inſide of the ſoleus. *n*, Soleus. *o*, The place where the tendon of the gemellus was cut off; but the fleſh of the ſoleus runs further down. *p*, Tendo achillis, with the plantaris. *q*, Peroneus longus, paſſing at the outer ancle to the ſole of the foot; beneath it, the peroneus brevis to the root of the metatarſal bone of the little toe; and between it and the tendo achillis, a portion of the flexer longus digitorum pedis. *r*, Tendons of the extenſor longus digitorum pedis, with the peroneus tertius; and beneath theſe, the extenſor brevis digitorum pedis. *s*, Flexer brevis minimi digiti pedis.

FIG. 2. *Represents the* SECOND LAYER *of* MUSCLES, *on the* ANTERIOR PART *of the* WHOLE BODY.

MUSCLES *situated on the* HEAD *and* NECK. *a*, Corrugator ſupercilii. *b*, Temporalis. *c*, Maſſeter. *d*, Levator anguli oris. *e*, Buccinator. *f*, Orbicularis oris. Oppoſite to the right ala naſi, is the portion of this muſcle which Albinus names Naſalis labii ſuperioris. *g*, Depreſſor labii inferioris. *h*, Sterno-cleido-maſtoideus, which is ſeen below, ariſing from the ſternum and clavicle, by two heads. *i*, Sterno-hyoideus. On the outſide of it, the omo-hyoideus. Further out, a portion of the hyo-thyroideus. *k*, Levator ſcapulæ.

TRUNK. *a*, Subclavius. *b*, Pectoralis minor. *c*, Serratus magnus. *d*, Rectus abdominis, divided into ſeveral fleſhy portions by its tendinous interſections. *e*, Pyramidalis. *f*, Obliquus aſcendens internus. *g*, Spermatic cord, with the origin of the cremaſter muſcle.

SUPERIOR EXTREMITY. *a*, Biceps flexor cubiti. *b*, Short head of the biceps. Beneath the upper part of it, a portion of the coraco-brachialis. Beneath the under part a portion of the brachialis internus. *c*, Long head of the biceps. At the bending of the arm, the tendon of the biceps, and the place where the tendinous aponeuroſis was cut from it, are ſeen. *d*, Extenſor carpi radialis longior. Beneath it a portion of the extenſor carpi radialis brevior. *e*, Flexor ſublimis perforatus. *f*, Inſertion of the extenſor carpi ulnaris. *g*, Extenſors of the thumb. *h*, Opponens pollicis. On the inſide of it, is a portion of the flexor pollicis brevis. *i*, Tendon of the flexor longus pollicis manus, after paſſing through the flexor brevis pollicis manus. *k*, Abductor minimi digiti manus. *l*, Flexor parvus minimi digiti manus. *m*. Ligamentum carpi annulare.

Inferior extremity. *a*, Iliacus internus. Between *a* and *b*, part of the pſoas magnus. *b*, Pectinalis. *c*, Triceps longus. *d*, Gracilis. *e*, Rectus cruris cut off near its origin. *f*, Tendon of the rectus cruris cut off above the patella, from which a ſtrong tendon is ſent to be inſerted into the tubercle of the tibia. *g*, Portion of the gluteus medius. On the inſide of it, is part of the gluteus minimus. *h*, Vaſtus internus. *i*, Vaſtus externus. *k*, Crureus. *l*, Inſertion of the biceps flexor cruris into the fibula. *m*, Tendons of the gracilis and ſemitendinoſus inſerted into the tibia. *n*, Soleus. *o*, Peroneus longus. *p*, Extenſor longus digitorum, with the peroneus tertius on the outſide, and extenſor pollicis proprius on the inſide. *q*, Soleus. *r*, Flexor longus digitorum. *s*, Tendons of the tibialis poſticus and flexor longus digitorum pedis. *t*, Flexor brevis digitorum pedis.

Fig. 3. Muscles *and* tendons *of the* inside *of the* hand.

1. Muſculus abductor pollicis. 2. Abductor pollicis. 3. Flexor brevis. 4. Quadratus, or palmaris brevis. 5. The ſtrong ligament of the carpus, that binds down the tendons of the flexors of the fingers. 6. Abductor minimi digiti. 7. A probe thruſt under the tendons of the perforatus. 8. A probe under thoſe of the perforans. 9. Lumbricales. 10. Perforatus. 11. Flexor carpi radialis. 12. Flexor carpi ulnaris.

Fig. 4. Muscles *and* tendons *of the* fore part *of the* foot.

1. Tendo achillis. 2. That part of the aſtragalus which articulates with the tibia. 3. The tendon of the tibialis anticus. 4. Tendon of the extenſor pollicis pedis longus. 5. Tendons of the extenſor digitorum communis. 6. Extenſor pollicis pedis brevis. 7. Extenſor digitorum brevis. 8. The union of the tendons of the extenſor longus and the extenſor brevis.

Fig. 5. *A* View *of the* Bladder *and its* Appendages.

1. The under ſide of the bladder. 2. The ureters. 3. Vaſa deferentia. 4. Veſiculæ ſeminales. 5. The proſtate gland. 6. Meatus urinarius.

Fig. 6. A Transverse Section *of the* Penis.

7. The corpora cavernoſa penis. 8. Corpus cavernoſum urethræ. 9. Urethra. 10. Septum penis. 11. The ſeptum between the corpus cavernoſum urethræ, and that of the penis.

EXPLANATION of PLATE VIII. Fig. 1 & 2.

Superficial absorbents *of the* lower extremity. A, The ſpine of the os ilium. B, The os pubis. C, The iliac artery. D, The knee. E, E, F, Branches of the crural artery. G, The muſculus gaſtrocnemius. H, The tibia. I, The tendon of the muſculus tibialis anticus. *On the outlines*, a, A lymphatic veſſel belonging to the top of the foot. b, Its firſt diviſion into branches. c, c, c, Other diviſions of the ſame lymphatic veſſel. d, A ſmall lymphatic gland. e, The lymphatic veſſels which lie between the ſkin and the muſcles of the thigh. f, f, Two lymphatic glands at the upper part of the thigh below the groin. g, g, Other glands. h, A lymphatic veſſel which paſſes by the ſide of thoſe glands with communicating with them ; and, bending towards the inſide of the groin at i, opens into the lymphatic gland k. Lymphatic glands appear in the groin, which are common to the lymphatic veſſels of the genitals and thoſe of the lower extremity ; and alſo a plexus of lymphatic veſſels is paſſing on the inſide of the iliac artery.

Posterior view *of the* lower extremity, *diſſected ſo as to ſhow the deeper ſeated* lymphatic vessels, *which accompany the arteries.* A, The os pubis. B, The tuberoſity of the iſchium. C, That part of the os ilium which was articulated with the os ſacrum. D, the extremity of the iliac artery appearing above the groin. E, The knee. F, F, The two cut ſurfaces of the triceps muſcle, which was divided to ſhow the lymphatic veſſels that paſs through its perforation along with the crural artery. G, The edge of the muſculus gracilis. H, The gaſtrocnemius and ſoleus, much ſhrunk by being dried, and by the ſoleus being ſeparated from the tibia to expoſe the veſſels. I, The heel. K, The ſole of the foot. The ſuperficial lymphatic veſſels appear paſſing over the knee to get to the thigh.

PART III. EXTERNAL SARCOLOGY, *and* ADENOLOGY.

Sect. I. Introductory Observations.

The different parts of the human body are ſo various, and ſo complicated, in their ſubſtance, as well as in their forms, and at the ſame time ſo neceſſarily connected together, by their relative ſituations, uſes, &c. that it is difficult, if not impoſſible, to form any general arrangement, ſo diſtinct as to diſtribute each part into its different claſſes, and yet ſo comprehenſive, as to include the whole under their reſpective diviſions, without repetitions and tautologies. Thus, for inſtance, the heart being a *muſcle*, ought to be claſſed under *Myology*, and the liver being a *gland*, ſhould be ranked under *Adenology* ; but both theſe important organs, being ſituated within the great cavities of the body, are generally arranged by anatomiſts, not according to their ſpecific nature, but agreeably to their ſituation ; the former being deſcribed along with the other contents of the thorax, and the latter amongſt the abdominal viſcera. It is doubtleſs owing to theſe difficulties, attending a ſtrict propriety of arrangement, that, although, in the introductions to moſt anatomical treatiſes, Sarcol-

OGY, and its ſubdiviſions, MYOLOGY, ADENOLOGY, SPLANCHNOLOGY, &c. are mentioned as proper diviſions of Anatomy, yet, we ſeldom or never find the parts arranged under them, in the courſe of ſuch works; or indeed, any farther notice taken of any anatomical branch, excepting OSTEOLOGY, and ſomtimes ANGEIOLOGY. And, therefore, although we have deviated ſo far from general cuſtom, as to adopt a mode of arrangement, different, in this reſpect, from our predeceſſors, yet we would not wiſh the reader to expect from the title ADENOLOGY, at the head of this part of the work, a particular account of *every gland* in the human body, as ſome of them fall neceſſarily to be noticed elſewhere.

SECT. I. GENERAL DIVISION *of the* TRUNK.

The human body is divided into three great cavities. Of theſe the uppermoſt is formed by the bones of the cranium, and incloſes the brain and cerebellum. The 2d is compoſed of the vertebræ of the back, the ſternum, and true ribs, with the additional aſſiſtance of muſcles, membranes, and common integuments, and is called the thorax. It contains the heart, lungs, &c. The 3d, and inferior cavity, is the abdomen. It is ſeparated from the thorax, by means of the diaphragm, and is formed by the lumbar vertebræ, the os ſacrum, the oſſa innominata, and the falſe ribs, to which we may add the peritonæum, and a variety of muſcles. This cavity incloſes the ſtomach, inteſtines, omentum or cawl, liver, pancreas, ſpleen, kidneys, urinary bladder, and parts of generation.

The hollow on the middle and inferior part of the thorax, below the breaſts, is called *ſcrobiculus cordis*. The middle of the abdomen, for about three fingers breadth, above and below the navel, is called *regio umbilicalis*: the middle part above this, *epigaſtrium*; on each ſide of the epigaſtrium, under the cartilage of the lower ribs, *hypochondrium*; and from below the regio umbilicalis, down to the oſſa ilia and oſſa pubis, *hypogaſtrium*.

SECT. II. *Of the* COMMON INTEGUMENTS.

Under the title EXTERNAL SARCOLOGY, we mean to comprehend, chiefly, the common integuments and membranes, with their appendages; amongſt which, one branch of adenology, viz. the cutaneous glands, falls naturally to be conſidered. In the diviſion of common integuments, are uſually included the epidermis, or ſcarf-ſkin, the reticulum mucoſum of Malpighi, the cutis or true ſkin, and the membrana adipoſa. The hair and nails, as well as the ſebaceous glands, may alſo be conſidered as appendages to the ſkin.

The CUTICULA, EPIDERMIS, OR SCARF-SKIN, is that thin inſenſible membrane, which is raiſed by bliſters in living bodies. It is extended over every part of the true ſkin, unleſs where the nails are. It appears when viewed in a microſcope, a very fine ſmooth membrane, only with ſome inequality of ſurface, where the *rete mucoſum* adheres to it. When we examine narrowly the ſmall paſſages through which the ſebaceous matter of the ſkin paſſes, the cuticle ſeems to enter theſe, in order to complete the ſecretory tubes. The foſſulæ of the hairs have likewiſe the ſame productions of the cuticle, and it ſeems to give a kind of covering to the hairs themſelves. Laſtly, the almoſt imperceptible ducts of the cutaneous pores are lined by it. Its uſe is to defend the true ſkin, that it may not be expoſed to pain from whatever it touches; and alſo to preſerve it from wearing. It is thickeſt on thoſe parts of the bottom of the foot, which ſuſtain the body, and on the hands of perſons much uſed to labour being ſo contrived by nature as to grow the thicker the more thoſe parts are uſed. In eruptive diſeaſes, the cuticula will ſometimes become ſcurfy, and full of little breaches, which are apt to remain even when the cauſe is taken away; but if the cuticle be taken off by a bliſter, the cuticle will be produced in a ſound ſtate.

The RETE MUCOSUM is a ſubſtance of a greyiſh colour, ſituated under the epidermis, which has been thought to repreſent a net work; hence it has got the name of *rete mucoſum*. It is of a ſoft, mucilaginous, and viſcid nature; and fills up the interſtices of the fibres running between the cutis vera and cuticula. After raiſing the cuticle in a negro, where it is thickeſt and moſt diſtinct, this ſubſtance appears of a black colour, and is compoſed of two diſtinct layers. It is this that chiefly gives the colour to the ſkin; for it is black in the African; white, brown, or yellowiſh, in the European. The origin of this mucous ſubſtance has not hitherto been ſufficiently explained; nor has it been fully determined what purpoſes it ſerves in the human body. Haller thinks it probable, that it is compoſed of a humour tranſuding from the ſurface of the cutis vera.

The CUTIS VERA, OR SKIN properly ſo called, is a ſubſtance of a very large extent, made up of ſeveral kinds of fibres, cloſely connected, and running in various directions, being compoſed of the extremities of numerous veſſels and nerves. This texture is what we commonly call *leather*; and it makes, as it were, the body of the ſkin. It is not eaſily torn; may be elongated in all directions, and will afterwards recover itſelf; and it is thicker and more compact in ſome places than in others. The outer ſurface of this ſubſtance is furniſhed with ſmall eminence, called *papillæ*. They appear through its whole ſurface like ſmall granulations; and ſeem to be calculated to receive the impreſſions of touch, being the moſt eaſily obſerved where the ſenſe of feeling is the moſt delicate, as in the points of the fingers and palms of the hands; and are ſuppoſed by many to be the capillary filaments of the cutaneous nerves, which terminate by ſmall radiated pencils.

The PAPILLÆ differ very much in figure and diſpoſition in different parts; and they may be diſtinguiſhed into ſeveral kinds. The papillæ of the palm of the hand, or the ſole of the foot, and of the fingers and toes, are higher than on the other parts of the body; but they are likewiſe ſmaller, cloſely united together, and placed as it were endwiſe with reſpect to each other, in particular rows, which repreſent on the ſkin all kind of lines, ſtraight, ſpiral, &c. Theſe lines are often diſtinctly viſible on the hand. The red part of the lips is made up of papillæ, reſembling very fine villi or hairs cloſely united; and there is another particular kind under the nails; the papillæ being there more pointed, or in a manner conical, and turned obliquely towards the ends of the fingers.

The CUTANEOUS GLANDS, or glands of the ſkin, merit particular notice under this ſection. In different parts of the body, we meet with ſmall glands or follicles of an oval form, and ſeated chiefly under the ſkin in the corpus adipoſum. They are compoſed of convoluted veſſels; and by diſcharging through ſmall excretory ducts, a fat and oily matter, they ſerve to lubricate and moiſten the ſkin. The fluid, thus ſecreted, ſometimes acquires a degree of thickneſs, and approaches to the conſiſtence of ſuet: and from this circumſtance, theſe glands have derived the name of SEBACEOUS. They are found chiefly on the noſe, ears, axillæ, &c. Beſides the ſebaceous glands, Steno, Malpighi, Verheyen, Winſlow, and other anatomiſts tell us, that the ſkin abounds with a ſort of glands, named MILIARY, from their reſemblance to millet ſeed, which are ſaid to open on the ſurface of the cuticle, and diſcharge the ſweat and matter of inſenſible perſpiration; yet after all that has been ſaid by authors about them, it is certain there are no glands of this kind that can be traced by diſſection.

The filamentary ſubſtance, called the BODY *of the* SKIN, is the almoſt univerſal integument of the body, and the baſis of all the other cutaneous parts. The ſkin is able to reſiſt external injuries to a certain degree, and defend the parts over which it extends from the effects of friction, blows, &c. to which the human body is often liable. The papillæ are the organs of feeling, and alſo contribute to an univerſal evacuation, called *inſenſible perſpiration.* They likewiſe ſerve to tranſmit from without, inwards, the ſubtle particles of ſubſtances applied to the ſkin. The firſt of theſe three uſes depends on the extremities of the nerves; the ſecond, on the arterial ſtructure; and the third, on the exiſtence of abſorbent veſſels on the ſurface. The cutaneous glands ſecrete an oily matter; yet without the epidermis, both the papillæ and glands would nevertheleſs be diſturbed in their functions. The epidermis keeps the nervous filaments of the papillæ in an even and regular ſituation; and likewiſe moderates the impreſſions of external objects. Another uſe of it is, to regulate the cutaneous evacuations already mentioned.

MEMBRANA ADIPOSA, the adipoſe, or fatty membrane, is the innermoſt integument of the body. It is compoſed of a congeries of membranous laminæ, joined irregularly to each other at different diſtances, ſo as to form numerous interſtices that communicate with each other. Theſe interſtices have been named CELLULÆ, and the ſubſtance they compoſe the *cellular membrane.* The thickneſs of the membrana adipoſa is not the ſame all over the body. It adheres very cloſely to the ſkin, and runs in between the muſcles, whoſe fibres it ſurrounds and connects. It is alſo the bond of union between the various cavities of the body and the membranes which line them.

The CELLULAR INTERSTICES are ſo many little bags filled with FAT; and theſe we find plentifully depoſited immediately under the ſkin, and filling up theſe interſtices between the external muſcles, which would otherwiſe have exhibited diſagreeable hollow or void places. In ſome parts the fat ſerves for a cuſhion, as on the buttocks, where the laminæ and cells are very numerous. Other parts have little or no fat; as on the forehead, elbows, &c. The fat is likewiſe of great uſe to the muſcles, in preſerving their flexibility, and in leſſening their mutual frictions. It may alſo be ſome defence againſt the cold, which, we find makes more impreſſion on lean than on fat perſons. This maſs of fat, which makes an univerſal integument of the body, is different from that which is found in the abdomen, thorax, canal of the ſpina dorſi, articulations of the bones, and in the bones themſelves. With regard to the difference exiſting between particular maſſes of fat in different parts, it conſiſts chiefly in the thickneſs or fineneſs of the pellicles, in the largeneſs or ſmallneſs of the cells, and in the conſiſtence of the contained matter.

SECT. III. *Of the* NAILS *and* HAIR.

To the nails and hair, we allot a ſeparate ſection, as they cannot properly be claſſed among the common integuments, only particular parts of the body being covered with them. The NAILS are of a compact texture, hard and tranſparent like horn. Their origin is ſtill a ſubject of diſpute. Malpighi ſuppoſed them to be formed by a continuation of the papillæ of the ſkin: Ludwig, on the other hand, maintained, that they were compoſed of the extremities of blood-veſſels and nerves. Both theſe opinions are now deſervedly rejected. They ſeem to poſſeſs many properties in common with the cuticle; like it they are neither vaſcular nor ſenſible, and when the cuticle is ſeparated from the true ſkin by maceration or other means, the nails come away with it. They appear to be compoſed of different layers, of unequal ſize, applied one over the other. Each layer ſeems to be formed of longitudinal fibres.

In each nail we may diſtinguiſh three parts, viz. the root, the body, or middle, and the extremity. The root is a ſoft, thin, and white ſubſtance, terminating in the form of a creſcent; the epidermis adheres very ſtrongly to this part; the body of the nail is broader, redder, and thicker, and the extremity is of ſtill greater firmneſs. The nails increaſe from their roots, and not from their upper extremity. Their principal uſe is to cover and defend the ends of the fingers and toes from external injury, and to enable us more nicely to handle ſmall objects, as well as to increaſe our power of graſping large bodies.

The HAIRS, which from their being generally known, do not ſeem to require any definition, ariſe from diſtinct capſules or bulbs ſeated in the cellular membrane under the ſkin. Some of theſe bulbs incloſe ſeveral hairs. They may be obſerved at the roots of the hairs, which form the beard or whiſkers of a cat. The hairs, like the nails, grow only from below, by a regular propulſion from their root, where they receive their nouriſhment. Their bulbs, when viewed with a microſcope, are found to be of various ſhapes. In the head of the ſcrotum they are roundiſh; in the eyebrows they are oval; in the outer parts of the body they are nearly of a cylindrical ſhape. Each bulb ſeems to conſiſt of two membranes, between which there is a certain quantity of moiſture. Within the bulb the hair ſeparates into three or four fibrillæ; the bodies of the hairs, which are the parts without the ſkin, vary in ſoftneſs and colour according to the difference of climate, age, or temperament of body.

The hairs likewiſe differ from each other, and may not be improperly divided into two claſſes; one of which may include the hair of the head, chin, pubes, and axillæ; and the other, the ſofter hairs, which are to be obſerved almoſt every where on the ſurface of the body in moſt people.

The ſkin of many people, however, excepting on the places above mentioned, is totally free of hair; and ſome individuals have not a ſingle hair on their whole body—not even upon the head or eye-brows, who, notwithſtanding, enjoy perfect health. The general uſe of hairs on the body does not ſeem to be abſolutely determined. On the head they doubtleſs ſerve for defence from injury, as well as to preſerve and increaſe the heat. Hairs on the eye-brows and eye-lids, are deſtined for particular uſes, which will be mentioned when thoſe parts are deſcribed.

SECT. IV. *Of* INSENSIBLE PERSPIRATION *and* SWEAT.

One of the moſt important offices of the ſkin is, to exhale moiſture from the body, and to abſorb vapours from the atmoſphere. The ſkin is replete with ſmall arteries, either coiled up into papillæ, or paſſing directly through it, which afford a paſſage to the INSENSIBLE PERSPIRATION; and leſt it ſhould be collected, as is the caſe in ſome diſeaſes, between the ſkin and the cuticle, there are pores in the cuticle correſponding with the exhaling veſſels of the ſkin, through which it freely paſſes. In a living perſon, this exhalation is many ways demonſtrable. A clean looking glaſs placed againſt the warm and naked ſkin, is quickly obſcured by the moiſt vapour. In ſubterraneous caverns, where the air is more denſe, it is evidently ſeen to fly off from the whole ſurface of the body, like a thick cloud.

When the motion of the blood is increaſed by heat or exerciſe, the ſmall cutaneous pores, inſtead of an inviſible vapour, diſcharge SWEAT, conſiſting of minute but viſible drops. The parts moſt ſubject to ſweat are the head, breaſts, arm pits, and foldings of the ſkin. There are many reaſons for ſuppoſing, that the perſpirable matter and ſweat are diſcharged through the ſame kind of veſſels, and that they differ only in the quantity of the matter, and the quickneſs of the evaporation. The nature and quality of the perſpired matter may be inveſtigated by experiments, and by conſidering its analogy to the pulmonary exhalation. What flies off from the lungs in this exhalation is chiefly water; and that the perſpirable matter is alſo chiefly water, is demonſtrated by its obſcuring a glaſs, and by ſeveral other teſts. The water of theſe vapours proceeds chiefly from what we drink, but it is alſo in part ſupplied from what is inhaled by the ſkin. The particular ſmell of the aliments taken into the ſtomach, may be ſometimes plainly perceived in the fluids we perſpire.

The QUANTITY of our perſpired moiſture is very great. whether we conſider the extent of the organ by which it is ſeparated, the abundance of vapours derived from the lungs only; or barely take a view of the experiments made by Sanctorius. This indefatigable phyſician calculated, that five pounds out of eight of the aliment is diſcharged in a healthy perſon, by inſenſible perſpiration alone. In cold climates, the quantity perſpired was found to be four and two ſevenths out of eight. But the cutaneous exhalation is even much greater than this; as not only a quantity of the aliment is thrown off, but likewiſe what is added to the blood by inhalation, which entering, often in a very conſiderable quantity, is thus again expelled. But different diſpoſitions of the air, and of the human body, cauſe great variations in theſe proportions. The difference of time after feeding alſo in ſome meaſure varies the quantity perſpired; but in general it is moſt copious, when the greater part of the digeſted nouriſhment is conveyed into the blood. It is naturally diminiſhed in ſleep, even in warm climates; but it is increaſed by the heat of bed-clothes.

The uſes of perſpiration are, to free the blood from its redundant water, and to throw out thoſe particles, which, by repeated circulation, have become excrementitious. Perſpiration likewiſe qualifies and ſoftens the cuticle. which is a neceſſary medium extended before the tender ſenſible papillæ of the ſkin. Haller contended, that beſides the exhalent veſſels before mentioned, the ſkin is full of ſmall veſſels, which inhale or abſorb thin vapours from the air. Theſe he conceived to have been demonſtrated by anatomical injections, which, if thin or watery, ſweated through them as through the arteries. But according to later phyſiologiſts, abſorption is performed ſolely by the lymphatic veſſels. That abſorption, however, does take place, is ſufficiently proved by the operation of medicines pervading the air, or applied to the ſkin: but ſtill more by the phenomena of ſome diſeaſes, where a much greater quantity of urine has been diſcharged than the quantity of drink taken in.

Theſe cutaneous veſſels, both exhaling and inhaling, are capable of contraction and relaxation by the power of the nerves. This appears from the effect of the paſſions of the mind; which, if joyful, increaſe the circulation, and relax the exhaling veſſels, ſo as to yield eaſier to the impulſe of the blood; from whence, with a ſhortening of the nerves, there follows a redneſs, moiſture, and turgeſcence of the ſkin. Theſe paſſions, on the contrary, which are ſorrowful, and retard the circulation, contract the exhaling veſſels; as appears from the dryneſs and corrugation of the ſkin, after frights; and from a diarrhœa being cauſed by terror. The ſame affections ſeem to open and increaſe the power of the inhaling veſſels, as variolous or peſtilential contagion is more liable to be contracted by perſons under the influence of fear.

A moderate and uniform perſpiration is uſually reckoned a ſign of health, becauſe it denotes a free pervious diſpoſition of the veſſels, and a complete digeſtion of the aliment. When it is diminiſhed, it indicates either a conſtriction of the ſkin, a weakneſs of the heart, or an imperfect digeſtion. Moderate exerciſe increaſes perſpiration conſiderably; as do alſo warm, watery, and vinous drinks, animal food of eaſy digeſtion, a moderate warm atmoſphere; and, a cheerful tranquil ſtate of mind. But though the contrary of theſe either leſſen or ſuppreſs perſpiration, we do not find that the continuance of life depends on a ſcrupulous exactneſs in the quantity diſcharged, which is ſo eaſily increaſed or diminiſhed by ſlight cauſes. When greatly or totally ſuppreſſed, however, it tends to produce diſeaſes of that nature, which depends on the putreſcent quality of the particles retained along with it.

SECT. V. *Of the* MEMBRANES *in* GENERAL.

Each diſtinct part of the body is covered, and every cavity is lined with a ſingle membrane, whoſe thickneſs and ſtrength is as the bulk of the part it belongs to, and as the friction to which it is naturally expoſed. Thoſe membranes, that contain diſtinct parts, keep the parts they contain together, and render their ſurfaces ſmooth, and leſs ſubject to be lacerated by the actions of the body; and thoſe which line cavities ſerve to render the cavities ſmooth, and fit for the parts they contain to move againſt.

The membranes of all the cavities that contain ſolid parts, are either beſet with glands, or provided with veſſels, which ſecrete a fluid or mucus, calculated to make the contained parts move freely againſt each other, and prevent their growing together; and thoſe cavities which are expoſed to the air, as the noſe, ears, mouth, and trachea, have in their membranes numerous little glands which ſeparate a mucus thick enough to defend them from the action of the air in reſpiration. Thoſe membranes, that have diſtinguiſhing names, and deſerve a particular deſcription, will be treated of as occaſion may require.

SECT. VI. ADENOLOGY: *Of the* GLANDS *in* GENERAL.

A GLAND is a ſmall round or oval body, chiefly compoſed of a convolution of one or more arteries of a conſiderable length, from whoſe ſides ariſe a vaſt number of excretory ducts. But though the larger ſecretions are made by viſible glands, yet unconvolved arteries may alſo have excretory ducts for the ſame purpoſe. In this way probably, ſecretions are made from all the membranes that line cavities, as well as in ſome other inſtances. There alſo ariſe from the arteries, which enter into the compoſition of a gland, lymphatic veſſels, whoſe uſe ſeems to be that of taking off the thinner parts of the blood, in thoſe caſes where a thick fluid is to be ſecreted. For lymphatics are to be found in greateſt plenty, in ſuch glands as ſeparate the thickeſt fluids; as in the teſticles and liver; and it is obſervable, that where the thickeſt ſecretions are made, the velocity of the blood is the leaſt, as if nature intended to give thoſe ſeemingly more tenacious parts more time to be ſeparated from the blood.

The arteries that compoſe different glands are convolved in different manners; but whether their different ſecretions depend upon that, is difficult to determine. The excretory ducts ariſe from the arteries, and unite in their progreſs, as the roots of trees do from the earth; whilſt the ducts, opening into different glands, ſeparate from the ſame maſs of blood their different juices. What theſe different ſecretions however depend upon, whether the peculiar œconomy of the parts, or the different attractions, of which they are rendered capable, we cannot ſay; although this ſubject has employed the attention of ſeveral ingenious anatomiſts.

The USE of the glands, however, evidently is, to ſeparate particular humours from the maſs of blood. They are uſually divided into two claſſes; but it ſeems more proper to diſtinguiſh three kinds of glands, viz. the mucous, conglobate, and conglomerate.

I. The MUCOUS GLANDS, or follicles as they are moſt commonly called, are ſmall cylindrical tubes continued from the end of the arteries. In ſome parts of the body, as in the tonſils, for example, ſeveral of theſe follicles may be ſeen folded together in one common covering, and opening into one common ſinus. Theſe follicles are the veſſels that ſecrete and pour out mucus in the mouth, œſophagus, ſtomach, inteſtines, and other parts of the body.

II. The CONGLOBATE GLANDS, are peculiar to the lymphatic ſyſtem. Every lymphatic vein paſſes through a gland of this kind in its way to the thoracic duct. They are met with in different parts of the body, particularly in the axilla, groin, and meſentery, and are either ſolitary or in diſtinct cluſters. See Part VI.

III. The CONGLOMERATE GLANDS are of much greater bulk than the conglobate, and ſeem to be an aſſemblage of many ſmaller glands. Of this kind are the liver, kidneys, &c. Some of them, as the pancreas, parotids, &c. have a granulated appearance. All theſe conglomerate glands are plentifully ſupplied with blood-veſſels; but their nerves are in general very minute, and few in number. Each little granulated portion furniſhes a ſmall tube, which unites with other ſimilar ducts, to form the common excretory duct of the gland.

SECT. VII. *Of the* SALIVAL GLANDS, THYMUS, *&c.*

The SALIVAL GLANDS may be thus enumerated: Glandulæ parotides, maxillares, ſublinguales, molares, buccales, labiales, linguales, amygdalæ, glandulæ palatinæ, uvulares, arytenoidææ, and glandula thyroidæa. Of theſe we ſhall only take notice of the moſt conſiderable.

I. The PAROTID GLANDS are two large, whitiſh glands irregularly oblong and protuberant, ſituated on each ſide, between the external ear and the poſterior or aſcending ramus of the lower jaw, and lying on ſome part of the neighbouring maſſeter muſcle. The ſuperior portion of this gland lies before the cartilaginous meatus of the ear, and touches the apophyſis zygomatica of the os temporis; extending forward and backward under the lobe of the ear, as far as the maſtoid apophyſis. From the anterior and ſuperior portion of this gland, a duct runs obliquely forward on the outſide of the maſſeter; and then perforates the buccinator, oppoſite to the interſtice between the ſecond and third dentes molares. The external carotid artery and vein, and the portio dura of the ſeventh pair of nerves, paſs through the ſubſtance of the parotid glands, to which they give branches.

II. The MAXILLARY GLANDS are ſmaller and rounder than the parotids; and are ſituated each on the inſide of the angle of the lower jaw, near the muſculus pterygoidæus inferior. From the inſide, or that which is turned to the muſculus hyo-gloſſus, each of them ſends out a duct in the ſame manner as the parotids: but it is ſmaller and longer, and goes by the name of *ductus ſalivalis Whartoni*, or *ductus inferior*.

III. The GLANDULÆ SUBLINGUALES are likewiſe two in number, of the ſame kind with the former, only ſmaller, ſomething oblong, and flatted like a blanched almond. They are ſituated, as their name implies, under the anterior portion of the tongue, one on each ſide, and ſend out laterally ſeveral ſhort ducts which open near the gums, at a ſmall diſtance from the frænum, and a little more backward.

IV. The GLANDULÆ MOLARES are two glands nearly of the ſame kind with the former, each being ſituated between the maſſeter and buccinator. Their ſmall ducts perforate the latter muſcle, and open into the mouth, near the laſt dentes molares; from which circumſtance they take their name.

V. The GLANDULÆ LINGUALES are thoſe of the foramen cæcum of the baſis of the tongue.

VI. UVULAR GLANDS are only a continuation of the membrane of the palate, in the form of a ſmall bunch of grapes. We might likewiſe reckon among the ſalival glands thoſe of the ſuperior portion of the pharynx, and alſo the follicles of the membrana pituitaria of the nares, and of the ſinuſes which communicate with them.

VII. The AMYGDALÆ are two glandular bodies of a reddiſh colour, lying in the interſtices between the two lateral half arches of the ſeptum palati, one on the right, the other on the left ſide of the baſis of the tongue. They ſomewhat reſemble an almond ſhell, in having an uneven ſurface, and in being full of little holes, through which their ſecretions are evacuated, whence they have obtained the Engliſh name of *Almonds*.

VIII. The GLANDULA THYROIDÆA is a large reddiſh maſs, covering the anterior convex ſide of the larynx. It ſeems to be made up of two oblong glandular portions united by their inferior extremities, below the cricoid cartilage, in ſuch a manner as to have ſome reſemblance to a creſcent, with the cornua turned upward. The two lateral portions lie on the muſculi thyroidæi, and the middle or inferior portion on the crico-thyroidæi. This gland ſeems to be of the ſame kind with the other ſalival glands, but is more ſolid. It is formed of glandulous grains, and of veſicles of different ſizes, full of a yellowiſh oily liquor, which may ſerve to lubricate the parts in its neighbourhood.

Secretion being very much promoted by preſſure upon the ſurface of a gland, the ſalival glands are ſo ſeated as to be preſſed by the lower jaw, and its muſcles which chiefly happens at theſe times when the fluid is wanted. The force too with which the jaw muſt be moved, being in proportion to the dryneſs and hardneſs of the food maſticated, the ſecretion from the glands depends very much upon the exertion of that force. All food requires to be reduced to a pulp, and mixed with ſaliva before it can be fitted for digeſtion; therefore the drier and harder foods, needing more of this ſecretion, will, from this mechaniſm, be ſupplied with more of it than moiſter foods, in that proportion in which they are drier and harder. What quantity of ſaliva theſe glands can ſeparate from the blood, in a given time, is not eaſy to determine, but we all know from experience how freely they act when neceſſity requires.

The THYMUS is a conglobate gland, the uſe of which is not perfectly aſcertained, its excretory duct not having yet been diſcovered. It is of an oblong figure, and is larger in the fœtus and in young children than in adults, being ſometimes nearly effaced in very old ſubjects. It is placed in the upper part of the thorax, between the two laminæ of the mediaſtinum; but at firſt is not altogether contained within the cavity of the cheſt, being found to border upon the upper extremity of the ſternum.

PART IV. SPLANCHNOLOGY.

SECT. I. *Of the* ABDOMEN *and its* GENERAL CONTENTS.

Although SPLANCHNOLOGY, in the ſtrict meaning of the word, reſpects only the bowels or contents of the abdomen, yet it would be improper to deſcribe the particular viſcera, without firſt taking notice of the great cavity which contains them.

The ABDOMEN, or LOWER BELLY, as it is commonly ſtiled by anatomiſts, (although none of them ever ſpeaks of an *upper* one) extends from the lower extremity of the ſternum, or the hollow, uſually called *scrobiculus cordis* or the *pit* of the ſtomach, to the lower part of the trunk. It conſiſts of three diviſions, called *regions*; viz. the *epigastric*, the *umbilical* and the *hypogastric*.

The EPIGASTRIC REGION, begins immediately under the ſternum, and extends to within two fingers breadths of the navel; where the middle or *umbilical region* begins and reaches to the ſame diſtance below the navel. The *hypogastric*, includes the reſt of the abdomen, as far as the os pubis. Each of theſe regions is ſubdivided into three others; two of which compoſe the ſides, and the other the middle part of each region.

The middle part of the upper region is called *epigastrium*, and its two ſides *hypochondria*. The middle part of the next region, the *umbilical region*, properly ſo called, and its two ſides, are the flanks, or *iliac* regions. Laſtly, the middle part of the lower region retains the name of *hypogastrium*, and its ſides are called *inguina* or groins.—The back part of the abdomen bears the name of *lumbar region*. Theſe are the diviſions of the lower belly, which ought to be remembered as they frequently occur in ſurgical and anatomical writings. We will now proceed to the contents of the abdomen and after mentioning the ſeveral viſcera contained in it, with their relative ſituations, deſcribe each of them ſeparately.

When the ſkin, adipoſe membrane, and abdominal muſcles are removed, we diſcover the peritonæum or membrane that envelopes all the viſcera of the lower belly. Upon opening the peritonæum, the firſt part that preſents is the omentum or cawl, floating on the ſurface of the inteſtines, which are likewiſe ſeen every where looſe and moiſt, and making a great number of circumvolutions through the whole cavity of the abdomen. The ſtomach is placed in the epigaſtrium, and under the ſtomach is the pancreas.—The liver fills the right hypochondrium, and the ſpleen is ſituated in the left. The kidneys are ſituated about the middle of the lumber region, and the urinary bladder and parts of generation are ſeated in the lower diviſion of the abdomen.

SECT. II. *Of the* PERITONÆUM *and* OMENTUM.

The PERITONÆUM is a ſtrong membrane which lines the whole cavity of the abdomen, and envelopes and partly ſupports the liver, ſpleen, omentum, ſtomach, inteſtines, and meſentery, with all their veſſels and glands. The ſuperior portion of it extends over that part of the diaphragm, which conſtitutes a part of the cavity of the abdomen. It may be conſidered as a ſingle membrane, though deſcribed by many anatomiſts as a duplicature of two diſtinct membranous laminæ. Its inner ſubſtance is very ſmooth, and poliſhed on that ſide which is next the viſcera, and it is continually moiſtened by a ſerous fluid, diſcharging through almoſt imperceptible pores, opening chiefly from the exhalent veſſels. The cellular ſubſtance, or external portion of the peritonæum, adheres very cloſely to the parts which form the inſides of the cavity of the abdomen; but it is not every where of an equal thickneſs.—Thoſe great blood veſſels, the aorta and vena cava, are involved in this cellular ſubſtance of the peritonæum. Indeed, it involves immediately and ſeparately, all the parts and organs which are commonly ſaid to lie in the duplicature of the peritonæum.

The principal uſes of the peritonæum are very evident. I tſerves to line the cavity of the abdomen, to inveſt the viſcera contained in that cavity as in a common bag, to ſupply them with particular coats, and to form productions, ligaments, connections, folds, &c. as we ſhall ſee hereafter. The fine fluid, which tranſudes through the whole internal ſurface of the peritonæum, prevents the inconveniences which might ariſe from the continual frictions and motions, to which the viſcera of the abdomen are expoſed, either naturally or by accident.

When this fluid is ſupplied in too great a quantity, or the abſorbents become incapable of carrying it off, it accumulates, and conſtitutes an aſcites or dropſy of the belly; and when by any means the exhalation is diſcontinued, the peritonæum thickens, becomes diſeaſed, and the viſcera are ſometimes found adhering to each other. The peritonæum is not very vaſcular. In a ſound ſtate it ſeems to be endued with little or no feeling, and the nerves that paſs through it appear to belong to the abdominal muſcles.

II. The **OMENTUM, EPILOON**, or cawl, is a fine membrane, interlarded with fat, in a kind of net work. It is formed by a duplicature of the peritonæum, and falls looſely over the ſurface of the ſmall inteſtines, reſembling an apron tucked up. Its outer or ſuperior portion, termed *ala ſuperior*, is connected to the bottom of the ſtomach, the ſpleen, and part of the duodenum; and thence deſcending a little lower than the navel, is reflected and tied to the colon, the ſpleen, and part of the duodenum. This laſt part is called *ala inferior*; and the ſpace between the alæ is named *burſa*. This cavity is very diſtinct in moſt brutes, but ſeldom ſo in men. Sometimes both alæ are tied to the liver, and, in diſeaſed bodies, where there has exiſted inflammation, to the peritonæum. Its uſe is to lubricate the inteſtines, in order that they may the eaſier perform their periſtaltic motions. Malpighi deſcribes adipoſe ducts in this membrane to carry the fat from the cells into the vena portæ, and thinks it a neceſſary ingredient in the bile.

This part was the only one known to the ancients under the name of *epiploon*; but at preſent we diſtinguiſh three omenta, viz. *magnum colico-gaſtricum*, *parvum hepatico-gaſtricum*, and *colicum*. They are all formed of two very delicate laminæ, ſeparated by a thin layer of cellular membrane. Theſe laſt are ſtiled by ſome anatomiſts, *appendices epiploicæ*.

The omentum magnum colico-gaſtricum derives its arteries from the ſplenic and hepatic. Its veins terminate in the vena portæ. Its nerves, which are very few, come from the ſplenic and hepatic plexus.

The omentum parvum hepatico-gaſtricum, abounds leſs with fat than the great epiploon. It begins at the upper part of the duodenum, extends along the leſſer curvature of the ſtomach as far as the œſophagus, and terminates about the neck of the gall-bladder, and behind the left ligament of the liver, ſo that it covers the leſſer lobe; near the beginning of which we may obſerve a ſmall opening, firſt deſcribed by Winſlow, through which the whole pouch may eaſily be diſtended with air. The veſſels of the omentum parvum are derived chiefly from the coronary ſtomachic arteries and veins.

The omentum colicum begins at the fore part of the cœcum and right ſide of the colon. It appears as a hollow conical appendage to theſe inteſtines, and uſually terminates at the back of the omentum magnum. It ſeems to be nothing more than a membranous coat of the cæcum and colon, aſſuming a conical ſhape when diſtended with air.

SECT. III. *Of the* ALIMENTARY CANAL, STOMACH, DIGESTIOND, *and* INTESTINES.

DUCTUS ALIMENTALIS, the alimentary duct or canal, conſiſts of the œſophagus, and ſtomach, together with the large and ſmall inteſtines; which though they are in fact only one long and extenſive canal, are diſtinguiſhed by different names; viz. the duodenum, jejunum, ilium, colon, cæcum, or appendicula vermiformis, (as ſome call it,) and rectum.

I. The **OESOPHAGUS**, or Gullet, is a canal partly muſcular and partly membranous; which commences at the inferior part of the mouth, to which it is joined by the pharynx, and deſcends along the neck and back part of the thorax, into the abdomen, where it joins to the ſtomach. It is made up of four coats: The firſt is formed only by a duplicature of the poſterior part of the mediaſtinum, and is wanting above the thorax and in the neck. The ſecond coat is made up of ſeveral ſtrata of fleſhy fibres, moſtly longitudinal, and their quantity is conſiderably greater. The third is termed the *nervous coat*, and is like that of the ſtomach and inteſtines. It is diſtributed in folds or plaits according to its length, and is ſurrounded by a whitiſh cotton-like ſubſtance, which, when ſteeped in water, ſwells and grows thicker. The fourth or innermoſt coat reſembles, in ſome meaſure, that of the inteſtines; except that, inſtead of the villi, it has ſmall and very ſhort papillæ. It is folded lengthwiſe like the 3d coat; ſo that the œſophagus, when cut acroſs, repreſents one tube within another. Through the pores of this coat, a viſcid lymph is continually diſcharged, to facilitate the paſſage of food into the ſtomach.

II. **VENTRICULUS**, the *Stomach*, is a great bag or reſervoir, ſituated partly in the left hypochondrium, and partly in the epigaſtrium. Its figure is like that of the bag of a bag-pipe; oblong, incurvated, large and capacious at one end, and ſmall and contracted at the other. We ſee in this kind of figure two arches or curvatures, one large, which runs along the greateſt convexity; and one ſmall, directly oppoſite to the former. The ſtomach has two openings, called its *orifices*; one between the great extremity and the ſmall curvature; the other at the end of the ſmall or contracted extremity. The firſt opening, named *cardia*, is a continuation of the œſophagus; the other joins the inteſtinal canal, and is called *pylorus*. The aliment paſſes down the œſophagus, into the ſtomach, through the cardia, and, after being digeſted paſſes through the pylorus, where the inteſtinal canal begins.

The great extremity of the ſtomach is in the left hypochondrium, and cloſe under the diaphragm. Yet the ſuperior orifice is not in the left hypochondrium, but almoſt oppoſite to, and very near the middle of, the bodies of the loweſt verteba of the back. Its ſmall extremity does not reach to the right hypochondrium, but bends obliquely backwards towards the upper orifice; ſo that the pylorus lies about two fingers breadth from the body of the vertebra immediately under the ſmall portion of the liver.

The ſtomach is compoſed of four tunics or coats, ſo intimately connected together that it requires no little dexterity in the anatomiſt to demonſtrate them. The exterior one is membranous, being derived from the peritonæum.—The ſecond is a muſcular tunic, compoſed of fleſhy fibres. which are in the greateſt number about the two orifices, The third is called the nervous coat, and within this is the villous or velvet-like coat, which compoſes the inſide of the ſtomach. The two laſt coats being more extenſive than the two firſt, form the folds, which are obſerved every where in the cavity of this viſcus, and more particularly about the pylorus; where they ſeem to impede the too haſty excluſion of the aliment, making a conſiderable plait, called *valvula pylori*. The inner coat is conſtantly moiſtened by a mucus, which approaches to the nature of the ſaliva, and is called the gaſtric juice; this liquor has been ſuppoſed to be ſecreted by certain minute glands ſeated in the nervous tunic, whoſe excretory ducts open the ſurface of the villous coat.

Here it is proper to take notice of that important operation of the ſtomach, called **Digestion**. By this term is underſtood, the changes our aliment undergoes for the formation of chyle. The manner in which this is performed has been matter of great controverſy. The different doctrines of fermentation, attrition, and ſolution by heat, as in the machine called Papin's Digeſter, have given way to more rational opinions. The experiments of the Abbe Spallanzani and Mr. Hunter uniformly prove that digeſtion is not effected by any fermenting power, by contractions of the ſtomach, or by heat; but by a peculiar fluid ſecreted in the coats of the ſtomach, called the GASTRIC juice. This is poured into the cavity, and there animalizes the food, or aſſimilates it to the nature of blood. It has alſo appeared that animals, or parts of animals, poſſeſſed of the living principle, when taken into the ſtomach, are not in the leaſt affected by the action of that viſcus; but the moment they loſe the living principle, they become ſubject to its digeſtive powers. This ſeems to be the caſe with the ſtomach, which is enabled to reſiſt the action of its juices in the living body; but when deprived of the living principle, it is then no longer able to reſiſt the powers of that menſtruum, which it had itſelf formed for the digeſtion of its contents, the proceſs of digeſtion appearing to be continued after death; ſo that the inner coat of the ſtomach itſelf is eroded.

After having been ſufficiently divided by maſtication, and mixed with ſaliva in the mouth, the food enters into the ſtomach, where it is thoroughly blended with the gaſtric juice. Here it is capable alſo of irritating the inner coat of the ſtomach to a certain degree, and occaſioning a contraction of its two orifices. In this membranous bag, ſurrounded by the abdominal viſcera, and with a certain degree of natural heat, the contents of the ſtomach undergo a conſtant agitation by means of the abdominal muſcles and of the diaphragm, and likewiſe by a certain contraction or expanſion of the muſcular fibres of the ſtomach itſelf. By this motion, every part of the food is expoſed to the action of the gaſtric juice, which gradually divides and attenuates it, and prepares it for its paſſage into the inteſtines.

After the food has remained from one to three hours in the ſtomach, it is converted into a greyiſh pulp, called *chymus*, and ſome few milky particles begin to appear. The time of its reſidence in this bag is proportioned to the nature of the aliment, and the ſtate of the ſtomach and its juices. The thinner and more perfectly digeſted parts paſs by a little at time into the duodenum; while the groſſer and leſs digeſted particles remain in the ſtomach, till they acquire a ſufficient degree of fluidity to paſs into the inteſtines, where the nature of this pulp is perfectly changed. The bile and pancreatic juice which flow into the duodenum, and the mucus, which is every where diſtilled from the ſurface of the inteſtines, mingle with the ejected matter, and ſtill farther attenuate and diſſolve it.

Two ſubſtances, very different from each other in their nature and deſtination, are the reſult of this combination. One of theſe, which is compoſed of the liquid parts of the aliment, and of ſome of its more ſolid particles, extremely divided and mixed with the juices we have deſcribed, conſtitutes a very mild, ſweet, and whitiſh fluid, reſembling milk, and diſtinguiſhed by the name of *chyle*. This fluid is abſorbed by the lacteal veſſels, which convey it into the circulation, where, by being aſſimilated into the nature of blood, it affords that ſupply of nutrition, which the continual waſte of the body requires. The other is the remains of the alimentary maſs, deprived of all its nutritious particles, and containing only ſuch parts as were rejected by the abſorbing mouths of the lacteals. This groſſer part, called the *fæces*, paſſes on through the courſe of the inteſtines, and is voided at the anus.

The **Intestinal Canal** is five or ſix times as long as the body, and forms many circumvolutions in the cavity of the abdomen, which it traverſes from the right to the left, and again from the left to right; in one place deſcending, and in another extending itſelf upwards. The inner coats of the inteſtines, being more capacious than their exterior tunics, form a multitude of plaits, placed at certain diſtances, and called *valvulæ conniventes*. Now this diſpoſition will be found to afford a farther proof of that divine wiſdom, which the anatomiſt and phyſiologiſt may diſcover in all their purſuits.—For if the inteſtinal canal was much ſhorter than it naturally is, if it paſſed in a direct courſe from the ſtomach, and if its inner ſurface was deſtitute of valves; the aliment would paſs with great rapidity to that anus, and ſufficient time would be wanting to aſſimilate the chyle, and abſorb it into the lacteals; ſo that the body would be deprived of the ſupply of nutrition, which is ſo eſſential to life and health.

The inteſtinal canal is divided into ſmall and large inteſtines; the former being diſtinguiſhed by the names of duodenum, jejunum, and ilium; and the latter by thoſe of cæcum, colon, and rectum. The former fill the middle and fore parts of the belly; the latter the ſides, and the upper and lower parts.

III. The **Duodenum** is ſo named, becauſe it is about 12 inches long. It begins from the pylorus at the extremity of the ſtomach, and is thence reflected downwards. It firſt paſſes by the gall-bladder, then under the following gut and meſentery, and coming once more in ſight in the left hypochondrium, it there commences jejunum, which is the ſecond of the ſmall inteſtines; but the place where this ends and the other begins is not preciſely determined.

IV. The JEJUNUM is ſo called from its being found for the moſt part empty. It is ſituated in the regio umbilicalis, and makes ſomewhat more than a third part of the ſmall inteſtines. It is diſtinguiſhed from the next ſucceeding inteſtine by its coats, which are ſomewhat thinner and leſs pale.

V. The ILIUM is a continuation of the former gut. It is ſituated in the hypogaſtrium, and very often ſome part of it paſſes into the pelvis, and lies upon the urinary bladder, eſpecially in women. It enters the colon on the ſide, near the upper edge of the os ilium. This great length of the ſmall inteſtines is evidently for the convenience of a greater number of lacteals, that the chyle which miſſes their orifices in one place may not eſcape them in another. Thoſe animals which ſwallow their food whole, and retain it for a long time, have the alimentary canal furniſhed with ſhorter and fewer lacteals.

VI. The large circumvolution of the ilium covers the firſt of the large inteſtines, called the CÆCUM, which ſeems properly to belong to the colon, being a kind of pouch of about four fingers wide, and nearly of the ſame length; having exteriorly a little appendix, called *appendix cæci*, or the *vermiform* appendix, from its reſemblance to a worm. Some anatomiſts reſtrict the name of cæcum to this little gut, which is prepoſterous, as the cæcum is ranked among the *great* inteſtines, and this *appendicula* is the ſmalleſt of them all. The arrangement here ſtated is, therefore, now generally adopted. The cæcum is placed in the cavity of the os ilium on the right ſide, and terminates in the *colon*, which is the largeſt of all the inteſtines.

VII. The COLON aſcends by the right kidney, to which it is attached; paſſes under the hollow part of the liver, and the bottom of the ſtomach, from the right hypochondrium to the left, and thence deſcends into the pelvis at the place where the appendix cæci joins it. One portion of the circumference of both is depreſſed, and forms a large fold on the inſide, which advances into the cavity of the inteſtine, and gets the name of *valve* of the *colon*. Thence the colon paſſes down towards the os ſacrum, where the canal takes the name of *rectum*. The colon, in its courſe, is alſo attached to the ſpleen and the left kidney.

VIII. The RECTUM, or *ſtraight gut*, is the laſt of all the inteſtines. It is ſo named, becauſe when viewed directly forward, it appears to run down in a ſtraight courſe from the laſt vertebræ of the loins, on the fore ſide of the os ſacrum, all the way to the os coccygis, where it ends in the *anus*. This inteſtine, properly ſpeaking, is a true continuation of the laſt convolution of the colon; and it is the repoſitory and common ſewer of the whole inteſtinal canal. The figure of the rectum varies according as it is full or empty. When empty, it is irregularly cylindrical, and ſinks in by a kind of tranſverſe folds; and in that ſtate it is about three fingers breadth in diameter. When full, it is wider in proportion, and may be diſtended to a conſiderable ſize.

IX. The extremity of the inteſtine which forms the ANUS, has ſeveral muſcles belonging to it, ſome ſurrounding it like ſphincters; the reſt broad fleſhy planes inſerted in it, and which, being likewiſe fixed to other parts, ſuſtain it in its natural ſituation, and reſtore it to that ſituation, after being diſturbed by the force neceſſary for the excluſion of the fæces.

All the inteſtines have the ſame coats with the ſtomach; the fibres of their middle or muſcular coats are circular, or ſpiral, and longitudinal; of the latter indeed but very few. The antagoniſts to theſe muſcular fibres of the ſtomach and guts, are formed by their contents, which are preſſed from one place to another, and the muſcles of the abdomen; for theſe alſo preſſing upon them alter their form into one leſs capacious, which neceſſarily extends their circular fibres. The large inteſtines have three membranes or ligaments on the outſide, running their whole length, and ſupporting the ſacculi, into which thoſe inteſtines are divided. The leſſer inteſtines have, at very ſmall diſtances, ſemilunar valves placed oppoſite to the interſtices of each other, to prevent the aliment from paſſing too ſpeedily through them; and the better to anſwer that end, they are larger and more numerous near the ſtomach, where the food is thinner, than they are towards the colon, where the food is continually made thicker in its progreſs, by a diſcharge of part of the chyle. This contrivance, ſo neceſſary to men, becauſe of their erect poſture, becomes a great inconvenience, when they are obliged, by ſickneſs or accident, to lie in an horizontal poſture, and calls for the help of clyſters and purges. But brutes have not theſe valves, becauſe they are not convenient in an horizontal poſture.

At the entrance of the ilium into the colon are two very large valves, which effectually hinder the regreſs of the fæces into the ilium. But clyſters have been frequently known to paſs them, and be vomited up; though it is doubtful whether the excrement that is ſometimes vomited up, is ſuch as had paſſed into the large inteſtines. The *valvulæ conniventes* in the colon are placed oppoſite, yet not in the ſame plane, to each other, and make, with their anterior edges, an equilateral triangle; but as the gut approaches the anus, they become leſs remarkable, and fewer in number. All the inteſtines have in their inner membrane an almoſt infinite number of very ſmall glands. Theſe glands will, eſpecially ſome of them in the larger guts, appear to the naked eye when they are diſeaſed. They have been called *glandulæ pierianæ*.

SECT. IV. *Of the* MESENTERY, LIVER, GALL-BLADDER, PANCREAS, *and* SPLEEN.

I. The great bundle of inteſtines, deſcribed in the laſt ſection, is not left to move at random in the cavity of the abdomen; but is carefully bound down by a membranous web, which prevents the inteſtinal convolutions from being entangled in each other, and yet allows them a gentle, floating, but limited motion.—This web, which is called the MESENTERY, is diſtinguiſhed into two portions; one very broad, and much plaited, which connects the ſmall inteſtines; the other, long and incurvated, which does the ſame to the large ones. But in fact theſe two portions conſiſt only of the membranous laminæ of the peritonæum doubled back upon itſelf, after having incloſed the inteſtines, and are diſtinguiſhed only by their breadth. Taken both together, they form a kind of ſpiral roll, more or leſs plaited in its circumference. The firſt portion, which accompanies the

the ſmall inteſtines, has retained the name of *meſentery;* thoſe parts of it, which are attached to the colon and rectum, are called *meſocolon* and *meſorectum.* Between theſe laminæ there are numerous blood-veſſels, many nervous filaments, and an infinite number of ſmall veſſels called *lymphatics*, of which afterwards.

The meſentery is attached to the lumbar vertebræ, which ſerves to keep the inteſtines in their natural ſituation. The idea uſually formed of the colic, called *miſerere*, is perfectly erroneous; it being impoſſible that the inteſtines can be *twiſted*, as many ſuppoſe that they are, in that diſeaſe, their attachment to the meſentery effectually preventing ſuch an accident—but a diſarrangement ſometimes takes place in the inteſtinal canal itſelf, which is productive of diſagreeable, and ſometimes fatal conſequences.—This is by an introſuſpection of the inteſtine, an idea of which may be eaſily formed, by taking the finger of a glove, and involving one part of it within the other. If inflammation takes place, the ſtricture in this caſe is increaſed, and the periſtaltic motion of the inteſtines, *i. e.* the progreſſive motion of the fæces downwards, is inverted, and what is called the *iliac paſsion* follows. The ſame effects may be occaſioned by the deſcent of the inteſtine, or of the omentum, either with it or by itſelf, and thus conſtituting what is called an *hernia* or *rupture;* a term by which in general is meant the falling down or protruſion of any part of the inteſtine, or omentum, which ought naturally to be contained within the cavity of the belly.

II. The **Liver** is the largeſt gland in the body; and its colour is that of a duſky or brown red. It is ſituated immediately under the diaphragm in the right hypochondrium. Its exterior ſide is convex, and interior concave. Backward towards the ribs it is thick, and thin on its fore part, where it covers the upper ſide of the ſtomach, and ſome of the inteſtines. The upper ſide of it is connected with the diaphragm, being alſo tied to that and the ſternum by a thin ligament, which is deſcribed commonly as two; the upper portion being named *ſuſpenſorium*, and the latter *latum:* but either of theſe names is ſufficient for the whole. It is alſo tied to the navel by a round ligament called *teres* or *umbilicale*, which is merely the umbilical vein of the fœtus condenſed into a ligament, and which is inſerted into the liver at a ſmall fiſſure in its lower edge. The ligamentum latum or ſuſpenſorium, ſuſtains the liver in an erect poſture, or rather fixes it in its ſituation, while it is ſupported by the other viſcera, they being compreſſed by the abdominal muſcles. When we are placed in an horizontal poſture, the teres prevents it from preſſing on the diaphragm; and in lying on the back they both together ſuſpend it, that it may not compreſs and obſtruct the aſcending vena cava. It is ſupplied with blood by the branches of the celiac and meſenteric arteries, called, in this viſcus, *arteriæ hepaticæ;* but its blood-veſſels, that compoſe it as a gland, are the branches of the vena porta, which enters the liver, and diſtributes its blood like an artery, to have the bile ſecreted from it; and the branches of the cava in the liver, which return the redundant blood into the cava aſcendens. It has alſo ſeveral branches of nerves, and a great number of lymphatics. Thoſe quadrupeds that have a great deal of motion in their backs, have their livers divided into many diſtinct lobules; which, by yielding to each other, obey thoſe motions, without any danger of laceration.

III. The **gall-bladder** is a receptacle for the bile, ſeated upon the inferior and concave ſurface of the liver. It is ſhaped like a pear, and compoſed of one denſe and ſomewhat muſcular coat, which is covered with peritonæum like that of the liver. It is alſo lined with another membrane that cannot eaſily be ſeparated, making three coats in the whole. From the gall-bladder towards the duodenum runs a duct called *cyſticus;* and from the liver to this duct, one called *hepaticus*, which carries off the gall this way, when the gall-bladder is full. The ductus cyſticus and hepaticus being then united and forming one common channel, commence *ductus communis choledochus*, which enters the duodenum obliquely about four inches below its commencement. The orifice of this duct in the gut is ſomewhat eminent, elevated above the ſurface, but has no caruncle, as has been deſcribed by ſome: As the liver, from its ſituation in the ſame cavity with the ſtomach, will be moſt preſſed, and conſequently ſeparate moſt gall where the ſtomach is fulleſt, namely, the time when it is moſt wanted; ſo the gall-bladder, lying next the duodenum, will have its fluid preſſed out by the aliment paſſing through that gut, and conſequently at a right time and in due proportion; becauſe the greater that quantity of aliment is, the greater will be the compreſſion; and *vice verſa.* A chemical analyſis of the bile, and experiments of its mixture with various ſubſtances, demonſtrate, that it contains a large portion of water, and a conſiderable quantity of inflammable oil, which appears very evidently in gall ſtones. The bile, therefore, is a natural ſoap; but of that ſort which is made from a volatile ſaline lixivium, mixed with oil and water, This, therefore, being intermixed with the aliment, reduced to a pulp, and ſlowly expreſſed from the ſtomach, by the periſtaltic force of the duodenum and preſſure of the abdominal muſcles, incorporates them all together; and the acid or aceſcent qualities of the food are in ſome meaſure thus corrected. The curd of milk is alſo diſſolved by it into a liquid, and the whole maſs of aliment inclined more to a putrid alkaleſcent diſpoſition. It diſſolves the oily matters, ſo that they may freely incorporate with the watery parts, and make up an uniform maſs of chyle to enter the lacteals; the ſurrounding mucus in the inteſtines is thereby abſterged and attenuated, and the periſtaltic motion is excited by its acrimony; all which offices are confirmed, by obſerving the contrary effects from a want or defect of this neceſſary fluid. The bile deſcends ſlowly along with the alimentary maſs; and having ſpent its force, moſt of it is afterwards excluded with the fæces; but probably ſome of the more ſubtile, watery, and leſs bitter parts, are again taken up by the abſorbents.

IV. The **pancreas**, or *ſweet bread*, as it is vulgarly called, is a large conglomerate gland of the ſalivary kind, lying acroſs the upper and back part of the abdomen, near the duodenum. It is a ſhort excretory duct, about half as large as a crow quill, though it is commonly painted as large as the ductus communis choledochus. It always enters the duodenum together with the bile duct, but in dogs at ſome diſtance from it; and, for the moſt part, in two ducts at a diſtance from one another. The fluids of this gland, together with the bile, help to complete the digeſtion of the aliment, and render it fit to be taken up by the lacteal veſſels. Winſlow has alſo obſerved, that, where the great extremity of the pancreas is connected to the curvature of the duodenum, it ſends down an elongation, which adheres very cloſely to the following portion of the inteſtine; and, upon a careful examination, he found a particular pancreatic duct ramified like the large one, which ran toward and interſected this great duct, into the extremity of which it opened after having perforated the duodenum. This portion he termed *pancreas minus*. It ſometimes opens ſeparately into the duodenum, in which we likewiſe obſerve ſeveral ſmall holes round the ductus choledochus, which anſwer to the pancreas.

V. The **Lien**, or *ſpleen*, is ſeated in the left hypochondrium, immediately under the diaphragm, and above the kidney, between the ſtomach and the ribs. It is ſupported by the ſub-contained parts, and fixed to its place by an adheſion to the peritoneum and diaphragm. It alſo furniſhes a point of attachment to the omentum, as has been already obſerved. The figure of it is a ſort of depreſſed oval, near twice as long as broad, and almoſt twice as broad as thick. Sometimes it is divided into lobules, but for the moſt part has only one or two ſmall fiſſures on its edge, and ſometimes none. In its colour it reſembles caſt iron. The inner texture, in brutes, is veſicular, like the penis, and contains grumous blood, and alſo ſmall bodies like glands; but Ruyſch denies that the human ſpleen is of the ſame texture. The ſpleen has often been removed from dogs without any remarkable inconvenience to them. Mr. Cheſelden ſpeaks of having ſeen in the human ſubject, two and three, and in one inſtance, four ſpleens. Some of theſe, though ſmall, differed from each other in ſize; others were nearly equal in bulk, but the whole together, in any one of theſe ſubjects, would not amount in ſize to more than a ſpleen of ordinary dimenſions. This want of an excretory duct to this viſcus has occaſioned the uſe of it to be doubtful and controverted. Anatomiſts indeed have gone no further than to conjecture, that it may prepare the blood for ſupplying a ſort of watery juice, (probably of a ſubalkaline nature, and rendered ſomewhat ſharp by the remora of the blood,) to the bile.

SECT. V. *Of the* KIDNEYS, URETERS, URINARY BLADDER, *and* GLANDULÆ RENALES.

I. The **kidneys** in the human ſubject greatly reſemble thoſe of the hog; and weigh about twelve ounces. They are ſeated towards the upper part of the loins upon the two laſt ribs; the right under the liver, and a little lower than the other, and the left under the ſpleen. Their uſe is to ſecrete the urine from the blood, which is brought thither for that purpoſe by the emulgent arteries; and what remains, after the functions of the gland have been performed, is returned by the emulgent veins, while the urine ſecreted is carried through the ureters into the bladder.

II. The **ureters** are two tubes, each of them about the bigneſs of a gooſe quill, and about a foot long. They ariſe from the indented ſide of the kidneys, and end in the bladder near its neck, running obliquely for the ſpace of an inch between its coats, by which mode of entering, their extremities form a kind of valves. The beginning of the ureters in the kidneys are the *tubuli urinarii*, which join together from the pelvis in each kidney. Between the tubuli urinarii, authors have remarked ſmall papillæ; and the parts which are diſtinguiſhed by a clearer colour are called *glandulæ*.

III. The **urinary bladder**, is ſeated in a duplicature of the peritonæum in the lower part of the pelvis of the abdomen. Its ſhape is orbicular, and its coats are the ſame with thoſe of the inteſtines and other hollow muſcles already deſcribed; viz. the external membranous, the middle muſcular, which is the *muſculus detruſor urinæ*, and the inner, a membranous coat, exceedingly ſenſible, as is well known to thoſe who have the ſtone, or are troubled with the gravel. The uſe of this nice ſenſe is to make it capable of that uneaſineſs, which excites animals to exclude their water, when the bladder is diſtended. This ſenſe indeed is naturally ſo delicate, that no fluid but healthy urine can be long endured; even pale urine, or urine with matter in it, in a degree excites the ſymptoms of the ſtone, and forces the patient to evacuate the bladder. Some writers have ſuppoſed the exiſtence of a ſhort paſſage for fluids into the bladder, from the copious and ſpeedy evacuations of pale urine, which ſucceed the drinking of weak intoxicating liquors, of mineral waters, &c. But the fact is, that there does not ſeem to be any other way for the urine to paſs, than that by the kidneys and along the courſe of the ureters. For the bladder is, on all ſides, ſeparated from the cavity of the abdomen by the peritonæum; nor is it probable that the vapours, which either go out from the bladder, or which are derived towards it from other parts, can here find open pores through the peritonæum. The bladder may be ſo diſtended with urine as to produce death; yet, in theſe caſes, we never obſerve that the urine has found any paſſage, through which it might eſcape into the pelvis. Again, when the ureters are obſtructed with ſtones, ſo that the bladder receives nothing from them, it is either quite empty, or contains a very acrimonious and thick urine, manifeſtly indicating that the water can find no other way from the kidney into the bladder. A careful attention, indeed, to the manner in which mineral waters are diſcharged by urine, ſufficiently demonſtrates that there is no ſuch rapidity therein as is commonly imagined; but the ſtimulus of the cold water received into the ſtomach, like the external cold applied to the ſkin, cauſes a concuſſion of the bladder and urinary parts, by which they are ſolicited to repeated diſcharges of the old urine, which was before in the body, and not immediately of that which was laſt drunk. Again, the largeneſs of the renal veſſels demonſtrates, that they cannot receive much leſs than an 8th part of the blood of the whole body at a time, and conſequently above a thouſand ounces of blood are conveyed through the kidneys in an hour; and it will appear but a moderate allowance for twenty or even fifty ounces of water to diſtil from that quantity of blood in the ſame time. Finally, it is certain, that both men and brutes periſh if the ureters are obſtructed; and in ſuch caſes, we obſerve, that no urine paſſes to the bladder.

IV. The **Glandulæ renales** are two glands ſeated immediately above the kidneys, of no certain figure, nor do we know their uſe; but anatomiſts always deſcribe them along with the urinary parts, becauſe of their ſituation. In a very young fœtus they are larger than the kidneys, and in an adult but a little larger than in the foetus. They receive a great many ſmall arteries, and return each of them one or two veins. In their inſide is a ſmall ſinus, tinctured with a ſooty coloured liquor.

Sect. VI. *Of the* Male Generative Organs.

The male organs of generation are partly ſituated within and partly without the abdomen. They have been uſually divided into the parts which ſerve to prepare the ſemen from the blood, and thoſe which are deſtined to convey it into the womb. But it ſeems more proper to diſtinguiſh them into the *preparing*, the *containing*, and the *expelling* parts, which are the different offices of the *teſtes*, the *veſiculæ ſeminales*, and the *penis*.

I. The TESTES are two glandular bodies ſeated in a looſe external membranous bag called the ſcrotum. Their office is to ſeparate the ſemen from the blood. They are ſaid to have four coats, two common and two proper. The common are the outer ſkin, and a looſe membrane or muſcle immediately underneath, called *dartos*. The firſt of the proper is the *tunica vaginalis*. It is continued from the peritonæum to the teſticle, which it incloſes with all its veſſels, but is divided by an adheſion or *ſeptum* immediately above the teſticle; ſo that no fluids can paſs out of that part of this membrane, which incloſes the teſticle. The other proper coat is the *tunica albuginea*, which is very ſtrong, and which immediately inveſts the teſticles. The teſtes receive each one artery from the aorta, a little below the emulgents. Theſe, unlike all other arteries, ariſe ſmall and dilate in their progreſs, that the velocity of the blood may be ſufficiently abated, for the ſecretion of ſo viſcid a fluid as the ſemen. The right teſticle returns its vein into the cava, and the left into the emulgent vein on the ſame ſide, both becauſe it is the readieſt courſe, and becauſe, as authors ſay, this ſpermatic vein would have been obſtructed by the pulſe of the aorta, if it had croſſed that veſſel to go to the cava. On the upper part of the teſticles are hard bodies called *epididymi*; which are evidently formed of the *vaſa deferentia*. They may without difficulty be unravelled backward, in ſingle veſſels, and then into more and ſmaller, like the excretory veſſels of ſome other glands.

II. The VASA DEFERENTIA are excretory ducts to carry the ſecreted ſemen into the *veſiculæ ſeminales*. They paſs from the epididymi of the teſticles, along with the blood-veſſels, till they have entered the muſcles of the abdomen; and then they paſs under the peritonæum, directly through the pelvis, to the veſiculæ ſeminales.

III. The VESICULÆ SEMINALES are two bodies that appear like irregular veſicles. They are ſeated under the bladder near its neck. They may be each of them unfolded into one ſingle duct, which diſcharges into the uretha, by the *caput gallinaginis*, which is an eminence in the under ſide of the urethra near the neck of the bladder. In theſe veſicles or ducts the ſemen is depoſited preparatory to the time of coition; but in dogs there are no veſiculæ ſeminales, therefore nature has given them a large bulb in the penis, which keeps them coupled, ſeemingly againſt their inclination, till the ſeed can be ſecreted and emitted into the uterus of the female. The ſemen paſſes from theſe veſiculæ in men in time of coition, through proſtrate glands into the urethra, and is thence emitted.

IV. The GLANDULÆ PROSTATÆ are two glands, or rather one, about the ſize of a nutmeg. They lie between the veſiculæ ſeminales and penis, under the oſſa pubis, almoſt within the pelvis. They ſeparate a limpid glutinous humour which is carried into the urethra by ſeveral ducts, that enter near thoſe of the proſtatæ. This liquor ſeems deſigned to be mixed with the ſemen in the time of coition, in order to make it flow more eaſily through two ſhort paſſages, which open into the urethra cloſe to a little eminence called *verumontamum*.

V. The PENIS is the vehicle or active organ of procreation. It is compoſed of two columns, the *corpora cavernoſa* and *corpus ſpongioſum*. The former, which conſtitute the greateſt part of the penis, are two cylindrical ligamentous tubes compoſed of minute cells of a ſpongy texture, which communicate with each other. Theſe two bodies are of a very pliant texture, and capable of conſiderable diſtenſion; and being united laterally to each other, occaſion by this union, a ſpace above, and another below. The uppermoſt of theſe ſpaces is filled by the blood veſſels, and the lower one, which is the largeſt, by the urethra and its corpus ſpongioſum. Theſe two cavernous bodies are at firſt only ſeparated by a partition of tendinous fibres, which allow them to communicate with each other; but they afterwards divaricate from each other, like the branch of a tree, and diminiſhing gradually in ſize, are attached, one on each ſide, to the inferior portion of the os pubis.

The CORPUS SPONGIOSUM PENIS, begins as ſoon as the urethra has paſſed the proſtrate, with a thick origin almoſt like a heart, firſt under the urethra, and afterwards above it, becoming gradually thinner, and ſurrounding the whole canal of the urethra, till it terminates in a conſiderable expanſion, and conſtitutes what is called the *glans penis*, which is exceedingly vaſcular, and covered with papillæ like the tongue. The penis is inveſted by the common integuments, but the cutis is reflected back *from the glans*, and covering it in a relaxed ſtate, is called *prepuce*. The prepuce is tied down to the under part of the relaxed glans by a ſmall ligament called *frænum*, which is in fact only a continuation of the cuticle and cutis.

VI. The URETHRA is a membranous canal, paſſing from the bladder through the whole extent of the penis. It affords a conveyance to the ſemen, which we have obſerved is occaſionally diſcharged into it from the veſiculæ ſeminales. The direction of this canal being firſt under and then before the pubis, occaſions a winding in its courſe from the bladder to the penis, not unlike the turns of the letter *S*.

The penis has three pairs of muſcles, the *erectores*, *accelerators*, and *transverſales*. Its arteries are chiefly derived from the internal iliacs. Some of them are ſuppoſed to terminate by pabulous orifices within the corpora cavernoſa, and corpus ſpongioſum; and others in veins. They ariſe from the great ſciatic nerve, and accompany the arteries in their courſe through the organ. The penis being of a ſpongy texture, the blood is conſtantly paſſing into its cells, through the ſmall branches of the arteries which open into them, and is from thence as conſtantly returned by the veins, ſo long as the corpora cavernoſa and corpus ſpongioſum continue to be in a relaxed and pliant ſtate. But when, through the influence of deſire, the erectores penis, &c. contract, the veins undergo a degree of compreſſion, and the paſſage of the blood through them is ſo much impeded, that it collects in them in a greater proportion than they are enabled to carry off.—Hence the penis gradually enlarges; and being more and more forcibly drawn up againſt the os pubis, the vena magna itſelf is at length compreſſed, and the penis becomes erect.

SECT. VII. *Of the* FEMALE GENERATIVE ORGANS.

Anatomical writers uſually divide the female organs of generation into *external* and *internal*. In the firſt diviſion they include the *mons veneris*, *labia pudendi*, *clitoris*, *nymphæ*, and *carunculæ myrtiformes*; and the latter, the *vagina*, with the *uterus*, and the parts connected with it.

I. The MONS VENERIS is that conſiderable riſing of fat which is covered with hair, and ſituated above the *foſſa magna* upon the os pubis. The great doubling of the ſkin, on each ſide of the rima, forms the *labia*; and within theſe there is a leſſer doubling, named *nymphæ*. Theſe help to cloſe up the orifice of the vagina; and alſo anſwer certain uſeful purpoſes in parturition.

II. The CLITORIS is a ſmall ſpongy body, bearing ſome ſlight analogy and reſemblance to the penis in men; but it has no perforation.—It begins with two crura from the oſſa iſchia, and uniting under the oſſa pubis, it proceeds to the upper part of the nymphæ, where it ends under a ſmall doubling of ſkin, called *præputium*: the end which is thus covered, is called *glans*. This part has been ſuppoſed the chief ſeat of woman's pleaſure in coition, as the glans penis is in men, but this is ſomewhat doubtful. A little below the clitoris, juſt within the vagina, is the exit of the *meatus urinarius*, which forms a ſmall riſing or nipple.

III. The VAGINA is ſeated between the bladder and rectum. The texture of it is membranous, and its orifice is contracted by muſcles, which act like a ſphincter; yet the poſterior extremity of it is ſufficiently capacious. The inner or poſterior extremity of this great canal ſurrounds the orifice of the uterus, a little obliquely, in ſuch a manner as that the upper ſide of the canal lies very near the orifice, and the lower ſide at a greater diſtance from it; and this makes the extremity of the uterus appear to advance more into the canal, on the lower than on the upper part.

IV. The anterior extremity of the vagina in virgins, and eſpecially before the menſes appear, is commonly bordered by *circuli membranosi*, or circular membranous folds, more or leſs ſmooth, and ſometimes ſemilunar; which, in a few ſubjects is quite imperforated ſo as to prevent menſtruation; in ſome leaves but a very ſmall opening, but in others, a larger, and in all renders the external orifice narrower than the reſt of the cavity. This fold, called *hymen*, (from the god of marriage,) is formed by the union of the internal membrane of the great canal, with that on the inſide of the alæ, and repreſents a membranous circle of different breadths, and ſometimes uneven. This membranous circle, though often deſtroyed by the fluor albus, or the acrimony of the blood in hæmorhagia, when conſiderable excoriation takes place, and alſo by accidental mechanical violence is generally in healthy conſtitutions a teſt of virginity; and is ruptured in the firſt act of coition, after which its remains gradually diſappear, and do not, as was formerly ſuppoſed, degenerate into the *carunculæ myrtiformes*, fleſhy tumours, ſo called from their reſemblance to myrtleberries, exiſting coeval with the hymen, and deriving no alteration in appearance from its rupture.

V. The UTERUS is ſeated at the termination of the vagina. In the virgin ſtate, it is about one inch thick, two broad, and large enough to contain the kernel of a nut: but in women, who have had children, it is larger. Its orifice into the vagina is called *os tincæ*, from the reſemblance it bears to a tench's mouth. It has two round ligaments which go from the ſides of it to the groins, through the oblique and tranſverſe muſcles of the abdomen, in the ſame manner as the ſeminal veſſels in men. It is by this way that the gut paſſes, in a hernia inteſtinalis in women. Near theſe are the *ligamenta lata*, which are nothing more than a duplicature of the peritonæum.

VI. Near the ſides of the uterus, and attached to the ligaments, are two bodies, called OVARIA. Theſe are of a depreſſed oval figure, about half the ſize of men's teſticles, and have ſpermatic veſſels. They contain ſmall pellucid eggs, from which circumſtance they take their name. There are two arteries and two veins, which paſs to and from theſe ovaries or teſtes, in the ſame manner that they do in men; but make many more windings, and the arteries dilate more ſuddenly, in proportion as they are ſhorter.—Theſe arteries and veins detach branches into the uterus and fallopian tubes, and not only form communications between the artery and vein on one ſide and thoſe of the other, but alſo with the proper veſſels of the uterus, which are detached from the internal iliac arteries and veins. From the minute branches of theſe veſſels within the uterus, the menſtrual evacuations are performed.

VII. The FALLOPIAN TUBES, (ſo named from Fallopius, who firſt diſcovered them,) are two flaccid, conical, and vermiform canals, ſituated tranſverſely on each ſide of the uterus, betwen the fundus and the lateral parts of the pelvis, and included in the anterior duplicatures of the ligamenta lata. Each of them is fixed by its narrow extremities in the corner of the fundus uteri, into which it opens, though by ſo narrow a duct as hardly to admit a large briſtle. From thence their diameter augments by degrees all the way to the other extremity, where it is about one third of an inch. The body of each tube goes in a winding courſe, and its large extremity is bent towards the ovaria. Theſe large extremities terminate by a narrow orifice, a little plaited and turned towards the ovarium, where it preſently expands in the form of a membranous fringe, called *fimbria*, or *morsus diaboli*, whoſe office is to receive the ovum in the time of coition, and convey it into the uterus through the fallopian tubes.

SECT. VIII. *Of* CONCEPTION, *and of the* FOETUS IN UTERO.

I. The ſubjects of CONCEPTION and GENERATION have employed the philoſophical world in all ages: but in following nature up to her minute receſſes, the philoſopher ſoon finds himſelf bewildered, and his imagination often ſupplies that which he ſo eagerly wiſhes to diſcover, but which is deſtined perhaps never to be revealed to him. Of the many theories which have been formed on this ſubject, that of the ancient philoſophers ſeems to have been the moſt ſimple: they conſidered the male ſemen as alone capable of forming the fœtus, and believed that the female only afforded it a lodging in the womb, and ſupplied it with nouriſhment after it was perfectly formed.

This opinion, however, ſoon gave place to another, in which the female was allowed a more conſiderable ſhare in conception. This ſecond ſyſtem conſidered the fœtus as being formed by the mixture of the ſeminal liquor of both ſexes, by a certain arrangement of its ſeveral particles in the uterus. But in the 16th century, veſicles or eggs were diſcovered in the ovaria or female teſticles; the fœtus had been found ſometimes in the abdomen, and ſometimes in the Fallopian tubes; and the two former opinions were exploded in favour of a new doctrine. The ovaria were compared to a bunch of grapes, being ſuppoſed to conſiſt of veſicles, each of which had a ſtalk; ſo that it might be diſengaged without hurting the reſt, or ſpilling the liquor it contained. Each veſicle was ſaid to include a little animal, almoſt complete in all its parts; and the vapour of the male ſemen being conveyed to the ovarium, was ſuppoſed to produce a fermentation in the veſicle, which approached the neareſt to maturity; and thus inducing it to diſengage itſelf from the ovarium, it paſſed into the tubæ Fallopianæ, through which it was conveyed to the uterus. Here it was ſuppoſed to take root like a vegetable ſeed, and to form, with the veſſels originating from the uterus, what is called the *placenta;* by means of which the circulation is carried on between the mother and the fœtus.

This hypotheſis, with all its abſurdities, continued to be almoſt univerſally adopted till the cloſe of the ſame century, when Lieuwenhoeck, by means of his glaſſes, diſcovered certain opake particles, which he deſcribed as ſo many animalcula, floating in the ſeminal fluid of the male. This diſcovery introduced a new ſchiſm among the philoſophers of that time, and gave riſe to a ſyſtem which is not yet entirely exploded. According to this theory, the male ſemen paſſing into the tubæ Fallopianæ, one of the animalcula penetrates into the ſubſtance of the ovarium, and enters into one of its veſicles or ova. This impregnated ovum is then ſqueezed from its huſk, through the coats of the ovarium, and being ſeized by the fimbriæ, is conducted through the tube to the uterus, where it is nouriſhed till it arrives at a ſtate of perfection.

In this ſyſtem there is much ingenuity; but there are certain circumſtances ſuppoſed to take place, which have been hitherto inexplicable. M. Buffon has endeavoured to reſtore the moſt ancient opinion, by allowing the female ſemen a ſhare in this office; aſſerting, that animalcula or organic particles are to be diſcovered in the ſeminal liquor of both ſexes. He derives the female ſemen from the ovaria, and he contends that no ovum exiſts in thoſe parts. But in this idea he is evidently miſtaken; and the opinion now moſt generally adopted is, that an impregnation of the ovum, by the influence of the male ſemen, is eſſential to conception. Of this, indeed, there can be no doubt; but as the manner in which ſuch impregnation is ſuppoſed to take place, and the means by which the ovum afterwards gets into the Fallopian tube, and from thence into the uterus, are ſtill accounted for chiefly by conjecture, we will not attempt to extend further inveſtigation of a ſubject, concerning which ſo little can be advanced with certainty.

II. In treating of the FOETUS IN UTERO, which, till the human figure can be diſtinctly perceived, is only ſtiled *Embryo*, we cannot help recollecting the obſervation of the poet,

To how *minute* an origin we owe
Bold Ammon, Cæſar, and the great Naſſau!

As opportunities of diſſecting the human gravid uterus occur but ſeldom, the ſtate of the embryo, immediately after conception cannot be perfectly known. When the ovum deſcends into the uterus, it is ſuppoſed to be very minute; and it is not till a conſiderable time after conception, that the rudiments of the embryo begin to be aſcertained. About the 3d or 4th week the eye may diſcover the firſt lineaments of the fœtus; but theſe lineaments are as yet very imperfect, it being only about the ſize of a common fly. Two little veſicles appear in almoſt tranſparent jelly; the largeſt of which is deſtined to become the head of the fœtus, and the other is reſerved for the trunk. But at this period no extremities are to be ſeen; the umbilical cord appears only as a very minute thread, and the placenta does not as yet abſorb the red particles of the blood.

At ſix weeks, not only the head but the features of the face begin to be developed. The noſe appears like a ſmall prominent line, and we are able to diſcover another line under it, which is deſtined for the ſeparation of the lips. Two black points appear in the place of eyes, and two minute holes mark the ears. At the ſides of the trunk, both above and below, we ſee 4 minute protuberances, which are the rudiments of the arms and legs.

At the end of 8 weeks, the body of the fœtus is upwards of an inch in length, and both the hands and feet are to be diſtinguiſhed. The upper extremities are found to increaſe faſter than the lower ones, and the ſeparation of the fingers is accompliſhed ſooner than that of the toes. At this period the human form may be deciſively aſcertained;—all the parts of the face may be diſtinguiſhed, the *ſhape of the body* is clearly marked out, the haunches and the abdomen are elevated, the fingers and toes are ſeparated from each other, and the inteſtines appear like minute threads.

At the end of the 3d month, the fœtus meaſures about 3 inches; at the end of the 4th month, 5 inches; in the 5th month, 6 or 7 inches; in the 6th month, 8 or 9 inches; in the 7th month, 11 or 12 inches; in the 8th month, 14 or 15 inches; and at the end of the 9th month or full time, from 18 to 22 inches. But as we have not an opportunity of examining the ſame fœtus at different periods of pregnancy, and as their ſize and length may be influenced by the conſtitution and mode of life of the mother, calculations of this kind are very uncertain. It would be improper to add more upon this ſubject here, as the poſture and nouriſhment of the fœtus in utero, and the deſcription of the chorion, amnion, liquor, amnii, placenta, &c. fall neceſſarily to be diſcuſſed under MIDWIFERY, to which we, therefore, refer the reader.

PART. V. INTERNAL SARCOLOGY.

SECT. I. *Of the* THORAX.

Without repeating the remarks already made, in our introduction to Part III, we ſhall but juſt obſerve here, that under Internal Sarcology, we mean only to comprehend the Thorax, with its *anterior* coverings and general contents ; all the other *fleſhy* parts of the body having been already deſcribed either under Myology, external Sarcology, Adenology, or Splanchnology.

The Thorax, or Cheſt, is that cavity of the trunk which extends from the clavicles, or the lower part of the neck, to the diaphragm, and includes the vital organs, which are the heart and lungs ; and likewiſe the pleura, mediaſtinum, trachea, œſophagus and thymus ; the two laſt of which we have already deſcribed : Part III. Sect. VII. and Part IV. Sect. III.

This cavity is ſeparated from that of the abdomen, by a fleſhy and membranous ſeptum, called the *diaphragm*. It is formed by the ribs and vertebræ of the back, covered by a great number of muſcles, and by the common integuments, and anteriorly by two glandular bodies called the *mammæ*. The ſpaces between the ribs are filled up by the muſcular fibres, which from their ſituation are called *intercoſtal muſcles*. Before we proceed to deſcribe the contents of the thorax, we ſhall give a particular deſcription of its anterior coverings, which, in the female ſex at leaſt, are of ſo much importance to man, upon his entrance into the world.

Sect. II. *Of the* Mammæ.

I. The Mammæ, or *breaſts*, are two eminences, more or leſs round, ſituated in the anterior and a little towards the lateral parts of the thorax ; their centre, or middle part, lying almoſt oppoſite to the bony extremity of the ſixth true rib on each ſide. Their ſize and figure vary in the different ſexes and in perſons of different ages. In children of both ſexes, and in males of all ages, they are commonly no more than cutaneous tubercles, or ſoft verrucæ of a reddiſh colour, called *papillæ*, or *nipples ;* each of them being ſurrounded by a ſmall, thin, and pretty broad circle or diſk, more or leſs of a browniſh colour, and an uneven ſurface, termed *areola*.

In females who have arrived at the age of puberty, which is ſometimes ſooner, ſometimes later, a third part is joined to the two former, which is a convex protuberance, more or leſs round, of about five or ſix fingers in breadth ; the papilla and aerola being ſituated near the middle of its convex ſurface. This is what is properly called *mamma ;* and it may be termed the *body of the breaſt*, when compared with the other two parts. It increaſes with age, and is very large in women with child, and in thoſe that give ſuck. In old age it decreaſes, and becomes flabby, loſing its natural conſiſtence and ſolidity.

The Body *of the* Mamma, is partly glandular, and partly conſiſts of fat ; or it is a gland of the conglomerate kind, ſurrounded on all ſides with cellular ſubſtance and fat. The glandular part is divided into little maſſes, ſeparated alſo by fat, and again ſubdivided into ſmall grandulæ, from which the lactiferous ducts ariſe. The cellulous pelliculæ ſupport a great many blood veſſels, lymphatics, and ſerous or lactiferous ducts, together with the ſmall glandular moleculæ already mentioned ; all of them being cloſely ſurrounded by two membranes continued from the pelliculæ. The innermoſt of theſe two membranes, which is in a manner the baſis of the body of the mamma, is thick, and almoſt flat, adhering to the muſculus pectoralis major. The ſecond, or external membrane, is thinner, forming a particular integument for the body of the mamma, more or leſs convex, and adhering cloſely to the ſkin.

III. The Corpus Adipoſum of the mamma, in particular, is a ſpongy cluſter, more or leſs interlarded with fat, or a collection of membranous pelliculæ, which, by the particular diſpoſition of their outer ſides, form a kind of membrane in ſhape of a bag, in which all the reſt of the corpus adipoſum is contained. The anterior or outer portion of this bag, or that which touches the ſkin, is very thin ; but that ſide next the pectoralis major is thick.

IV. The glandular body contains a white maſs, which is merely a collection of membranous ducts, narrow at their origin, broad in the middle, and which contract again as they approach the papilla, near which they were ſuppoſed by ſome to form a circle of communication ; but, from the obſervations of the lateſt anatomiſts, the ducts have little or no communication with each other at this place. They are named *ductus lactiferi ;* and, in their courſe, are accompanied by a ligamentous elaſtic ſubſtance, which terminates with them in the nipple. Both this ſubſtance, and the ducts it contains, are capable of conſiderable extenſion and contraction ; but, in their natural ſtate, they are moderately corrugated, ſo as to prevent an involuntary flow of milk, unleſs the diſtending force be very great, from the accumulation of too great a quantity.

V. The Areola, *i. e.* the coloured circle, or diſk, already mentioned, is formed by the ſkin ; the inner ſurface of which ſuſtains a great number of ſmall glandular moleculæ, of that kind which Morgagni calls *glandulæ ſebaceæ*, They appear very plainly all over the areola, even on the outſide, where they form little flat heights or eminences, at different diſtances, quite round the circle. Theſe tubercles are perforated by ſmall holes, through which a kind of ſebaceous matter, more or leſs liquid, is poured out, to defend the areola and nipple. Sometimes one or more of the lactiferous ducts have been found to terminate upon the ſurface of the areola. Hence Morgagni was led to think, that the glands there are of the lactiferous kind.

VI. The tubercle which lies in the centre of the areola, is termed Papilla, or the *nipple*. It is of different ſizes in different ages and conſtitutions, and in the different conditions of females in particular. In women with child, or who give ſuck, it is large, and generally longer or higher than it is thick or broad ; and when it happens to be ſhort it cauſes great uneaſineſs to the child. The texture of the nipple is ſpongy, elaſtic, and liable to divers changes of conſiſtence, being ſometimes harder, ſometimes more flaccid. It ſeems to conſiſt chiefly of ligamentary faſciculi ; the extremities of which form the baſis and apex of the nipple. Theſe faſciculi appear to be gently folded, or curled, during their whole length ; and though, by drawing the fibres out, theſe folds ſeem to be obliterated, they return again as ſoon as that action ceaſes.

From twelve to fifteen, or twenty particular Tubes are lodged between theſe ſpongy and elaſtic faſciculi, at ſmall diſtances from each other, and all in the ſame direction. Theſe tubes go to the baſis of the papilla, and run through the apex by the ſame number of almoſt imperceptible holes.

or orifices ; and as they are cloſely united to the elaſtic faſciculi, they are folded in the ſame manner with them.

The papillæ are covered by a thin cutaneous production, and by the epidermis. Its outer ſurface is uneven, being full of ſmall tubercles and wrinkles ; among which, thoſe near the circumference of the nipple ſeem to have a tranſverſe or annular diſpoſition, which, however, is not uniform. This direction ſeems to be owing to the elaſtic folds already mentioned : and, from this ſimple ſtructure, it is eaſy to explain how infants in ſucking the nipple, and women in drawing the teats of cows, bring out the milk. For the excretory tubes, being wrinkled in the ſame manner as the faſciculi, do, by thoſe wrinkles or folds, as by ſo many valves, hinder the milk contained in the ducts from flowing out ; but, when the nipple is drawn and elongated, the tubes loſe their folds, and the paſſage becomes ſtraight. Beſides this, when they are drawn with a conſiderable force, the whole body of the mamma is increaſed in length, and contracted in breadth, and thereby the milk is preſſed into the open tubes; and thus, by barely preſſing the body of the breaſt, the milk may be forced toward the nipple, and even through the tubes. Theſe, who underſtand the principles of the air pump, will readily conceive the manner in which the child draws out the milk.

VI. The ARTERIES and VEINS, diſtributed through the mammæ, are ramifications of the arteriæ and venæ mammariæ ; of which one kind comes from the ſub-claviæ, and are named *mammariæ internæ ;* the others, from the anxillares, called *mammariæ externæ*. Theſe veſſels communicate with each other, with thoſe near them, and with the vaſa epigaſtrica. The nerves come chiefly from the coſtacles, and by means of theſe, communicate with the nervi ſympathetici. The mamma has numerous lymphatic veſſels, which Wriſberg obſerves run in two ſets: Moſt of theſe veſſels gradually collect into a great plexus, which go to the axillary glands ; but others enter the thorax, through the interſtices of the ribs, near the ſternum, and communicate with the glands behind the mammary veſſels.

The MILK, examined chemically, appears to be compoſed of oil, mucilage, and water, and of a conſiderable quantity of ſugar. The generality of phyſiologiſts have ſuppoſed that, like the chyle, it frequently retains the properties of the aliment and medicines taken into the ſtomach ; but from ſome late experiments, this ſuppoſition appears to be ill founded.

SECT. III. *Of the* DIAPHRAGM, PLEURA, *and* MEDIASTINUM.

I. The DIAPHRAGM, or *midriff*, is chiefly compoſed of muſcular fibres ; and on this account ſyſtematic writers uſually place it among the muſcles. Its middle part is tendinous, and it is covered by the pleura above, and by the peritonæum below. It ſeems to have been improperly named *ſeptum tranſverſum*, as it does not make a tranſverſe diviſion between the thorax and the abdomen, but forms a kind of vault, the fore part of which is attached to the ſternum. Laterally it is fixed to the laſt of the true ribs, and to all the falſe ribs ; and its lower and poſterior part is attached to the vertebræ lumborum, where it may be ſaid to be divided into two portions or crura.

The principal arteries of the diaphragm are derived from the aorta, and its veins paſs into the vena cava. Its nerves are chiefly derived from the cervical pairs. It affords a paſſage to the vena cava through its tendinous part, and to the œſophagus through its fleſhy portion. The aorta paſſes down behind it, between its crura. The diaphragm not only ſerves to divide the thorax from the abdomen, but by its muſcular ſtructure is rendered one of the chief agents in reſpiration. When its fibres contract, its convex ſide, which is turned towards the thorax, becomes gradually flat, and by increaſing the cavity of the breaſt, affords room for a complete dilatation of the lungs, by means of the air which is then drawn into them by the act of inſpiration. The fibres of the diaphragm then relax ; and as it reſumes its former ſtate, the cavity of the thorax becomes gradually diminiſhed, and the air is driven out again from the lungs by a motion contrary to the former one, called *exſpiration*.

The diaphragm likewiſe ſerves ſeveral other purpoſes in the animal œconomy. It is in ſome meaſure, by means of it, that we void the fæces at the anus, and empty the urinary bladder. The acts of coughing, ſneezing, ſpeaking, laughing, gaping, and ſighing, could not take place without its aſſiſtance ; and the gentle preſſure, which all the abdominal viſcera receive from its conſtant and regular motion, cannot fail to aſſiſt in the performance of the ſeveral functions which were aſcribed to thoſe viſcera.

II. The PLEURA is a fine membrane which lines the whole cavity of the thorax, in the ſame way as the peritonæum incloſes the contents of the abdomen. An inflammation of this membrane conſtitutes the diſeaſe called pleuriſy.

The pleura is plentifully ſupplied with arteries and veins, from the internal mammary and the intercoſtals. Its nerves, which are very inconſiderable, are derived chiefly from the dorſal and intercoſtal nerves. The ſurface of the pleura, like that of the peritonæum, and other membranes lining cavities, is conſtantly bedewed with a ſerous moiſture, which prevents adheſions of the viſcera.

III. The MEDIASTINUM is formed by the union of the two lateral portions of the pleura, and divides the thorax lengthways into two cavities, one for each lobe of the lungs. At the lower part of the thorax, theſe laminæ afford a lodgement to the heart ; and at the upper part of the cavity, they receive between them the thymus. The mediaſtinum does not, however, divide the thorax exactly in the middle, but towards the left ſide ; and is ſo diſpoſed, that the two cavities, into which it divides the thorax, do not end towards this membrane in an angle, but a ſegment of a circle.

Its uſe is to prevent one lobe of the lungs from preſſing on the other, as in lying on one ſide the uppermoſt might do. But it is of ſtill more importance, in preventing the diſorders of one lobe of the lungs from affecting the other; for if the functions of both lobes were ſuſpended by any diſeaſe at the ſame time, death muſt enſue. If, for inſtance, the point of a ſword were to penetrate between the ribs into the cavity of the thorax, the lungs on that ſide would ceaſe to perform their office ; becauſe the air being admitted through the wound, would prevent the dilatation of that lobe ; but the other lobe, which is ſeparated from it by the mediaſtinum, would remain unhurt, and continue to perform its function as uſual.

SECT. IV. *Of the* TRACHEA, *the* LUNGS, *and* RESPIRATION.

I. The TRACHEA, or *windpipe*, is a cartilaginous and membranous canal, through which the air paſſes into the lungs. Its upper part, which is called the LARYNX, is compoſed of five cartilages. The uppermoſt of theſe cartilages is placed over the glottis or mouth of the larynx, and is called *epiglottis*, which performs the office of cloſing the paſſage to the lungs in the act of ſwallowing. At the ſides of the glottis are placed the two arytenoide cartilages, which are of a very complex figure, not eaſy to be deſcribed.

The anterior and larger part of the larynx is made up of two cartilages, one of which is called *thyroides* or *scutiformis*, from its being ſhaped like a buckler; and the other *cricoides* or *annularis*, from its reſembling a ring. Both theſe cartilages may be felt immediately under the ſkin, at the fore part of the throat; where the thyroides, by its convexity, forms an eminence called *Pomum Adami*, which is uſually more conſiderable in the male than in the female ſubject.—All theſe cartilages are united to each other by means of very elaſtic, ligamentous fibres; and are enabled, by the aſſiſtance of their ſeveral muſcles, to dilate or contract the paſſage of the larynx, and to perform that variety of motion, which ſeems to point out the larynx as the principal organ of the voice; for when the air paſſes out through a wound in the trachea, it produces no ſound. Theſe cartilages are moiſtened by a mucus, which ſeems to be ſecreted by minute glands ſituated near them. The upper part of the trachea is covered anteriorly and laterally by a conſiderable body, which is ſuppoſed to be of a glandular ſtructure; and from its ſituation near the thyroid cartilage is called the *thyroid gland;* though its excretory duct has not yet been diſcovered, or its real uſe aſcertained.

The GLOTTIS is interiorly covered by a very fine membrane, which is moiſtened by a conſtant ſupply of a watery fluid. From the larynx, the canal begins to take the name of *trachea* or *aspera arteria*, and extends from thence as far down as the third or fourth vertebra of the back, where it divides into two branches, which are the right and left bronchial tubes. Each of theſe bronchi ramifies through the ſubſtance of that lobe of the lungs, to which it is diſtributed, by an infinite number of branches, which are formed of cartilages ſeparated from each other like thoſe of the trachea, by an intervening membranous and ligamentary ſubſtance. Each of theſe cartilages is of an angular figure; and as they become gradually leſs and leſs in their diameter, the lower ones are in ſome meaſure received into thoſe above them, when the lungs, after being inflated, gradually collapſe by the air being puſhed out from them in expiration. As the branches of the bronchi become more minute, their cartilages become more and more angular and membranous, till at length they are found to be perfectly membranous, and at laſt become inviſible.

The trachea is furniſhed with fleſhy or muſcular fibres; ſome of which paſs through its whole length longitudinally, while the others are carried round in a circular direction; ſo that by the contraction or relaxation of theſe fibres, it is enabled to ſhorten or lengthen itſelf, and likewiſe to dilate or contract the diameter of its paſſage. The trachea and its branches, in all their ramifications, are furniſhed with a great number of ſmall glands which are lodged in their cellular ſubſtance, and diſcharge a mucous fluid on the inner ſurface of theſe tubes.

As the cartilages of the trachea keep it conſtantly open, they afford a free paſſage to the air, which we are obliged to reſpire inceſſantly; and its membranous part, by being capable of contraction and dilatation, enables us to receive and expel the air in a greater or leſs quantity, and with more or leſs velocity, as may be required in ſinging or in declamation. This membranous ſtructure of the trachea poſteriorly ſeems likewiſe to aſſiſt in the deſcent of the food, by preventing that impediment to its paſſage down the œſophagus, which might be expected if the cartilages were complete rings. The trachea receives its arteries from the carotid and ſubclavian arteries, and its veins paſs into the jugulars. Its nerves ariſe from the recurrent branch of the 8th pair, and from the cervical plexus.

II. The LUNGS are compoſed of two lobes, one ſeated on each ſide of the mediaſtinum. Each of theſe lobes is ſubdivided into two or three lobules, a kind of ſtructure particularly diſtinguiſhable in ſuch animals as have much motion in their backs, and for the ſame end that the liver is in the ſame animals. Their ſubſtance is compoſed of very ſmall cells, which are the extremities of the *trachea arteria* or *bronchos*. The figure of theſe cells is irregular; yet they are fitted to each other ſo as to have common ſides, and leave no void ſpace. Within theſe cells there is ſecreted a quantity of mucus, and alſo a large quantity of the materia perſpirabilis, which at once keeps the lungs from being dried by the air, and produces the neceſſary diſcharge from the blood, which alſo takes place by perſpiration thro' the ſkin. Throughout the whole texture of theſe cells are diſtributed the branches of the pulmonary artery and vein, which ramify to an infinite degree of minuteneſs, and ſupply the laſt mentioned ſecretions.

The pulmonary artery and vein, however, are not intended for the nouriſhment of the lungs; but the blood, in its paſſage through them, acquires certain eſſential properties from the action of the air, which it had loſt in circulating through the reſt of the body. The lungs are nouriſhed from the arteriæ bronchiales, whoſe ramifications are ſeen creeping every where on the branches of the bronchi. The blood is brought back from them into the vena azygos by the bronchial vein.

III. RESPIRATION conſtitutes one of thoſe functions which are properly termed *vital*, as being eſſential to life; for to live and to breathe are in fact ſynonymous terms. It conſiſts in an alternate contraction and dilatation of the thorax, by firſt inſpiring air into the lungs, and then expelling it from them in exſpiration. It will perhaps be eaſy to diſtinguiſh and point out the ſeveral phenomena of reſpiration; but to explain their phyſical cauſe will be attended with difficulty: for it will naturally be enquired, how the lungs, when emptied of the air, and contracted by exſpiration, become again inflated, they themſelves being perfectly paſſive? How the ribs are elevated in oppoſition to their own natural ſituation? and why the diaphragm is contracted downwards towards the abdomen? Were we to aſſert that the air, by forcing its way into the cavity of the lungs, dilated them, and conſqnently elevated the ribs, and preſſed down the diaphragm, we ſhould ſpeak erroneouſly.

What induces the firſt inſpiration, it is not eaſy to aſcergain; but after an animal has once reſpired, it would ſeem likely that the blood, after exſpiration, finding its paſſage through the lungs obſtructed, becomes a ſtimulus, which induces the intercoſtal muſcles and the diaphragm to contract, and enlarge the cavity of the thorax, in conſequence perhaps of a certain nervous influence, which we will not here attempt to explain. The air ruſhes into the lungs; every branch of the bronchial tubes, and all the cellular ſpaces into which they open, become fully dilated; and the pulmonary veſſels being equally diſtended, the blood flows through them with eaſe. But as the ſtimulus which firſt occaſioned this dilatation ceaſes to operate, the muſcles gradually contract, the diaphragm riſes upwards again, and diminiſhes the cavity of the cheſt; they return to their former ſtate; and as the air paſſes out in exſpiration, the lungs gradually collapſe, and a reſiſtance to the paſſage of the blood again takes place. But the heart continuing to receive and expel the blood, the pulmonary artery begins again to be diſtended, the ſtimulus is renewed, and the ſame proceſs is repeated, and continues to be repeated, in a regular ſucceſſion during life.

Although the muſcles of reſpiration, having a mixed motion, are in ſome meaſure dependent on the will, yet no human being, after having once reſpired, can live many moments without it. In attempting to hold one's breath, the blood ſoon begins to diſtend the veins, which are unable to empty their contents into the heart; and we are able only, during a very ſhort time, to reſiſt the ſtimulus to inſpiration. In drowning, the circulation ſeems to be ſtopped upon this principle; and in hanging, the preſſure made on the jugular veins, may co-operate with the ſtoppage of reſpiration to bring on death.

Phyſiologiſts, till within theſe few years, were entirely ignorant of the uſe of reſpiration. It was at length diſcovered in part by the celebrated Dr. Prieſtley. He found that the air exſpired by animals was phlogiſticated; and that the air was fitter for ſupporting animal life, in proportion as it was freer from the phlogiſtic principle. It had long been obſerved, that the blood in paſſing through the lungs acquired a more florid colour. He therefore ſuſpected, that it was owing to its having imparted phlogiſton to the air: and he ſatisfied himſelf of the truth of this idea by experiments, which ſhowed, that the craſſamentum of extravaſated blood phlogiſticated air, in proportion as it loſt its dark colour. He farther found, that blood thus reddened had a ſtrong attraction for phlogiſton; inſomuch that it was capable of taking it from phlogiſticated air, thereby becoming of a darker colour. From hence it appeared that the blood, in its circulation through the arterial ſyſtem, imbibes a conſiderable quantity of phlogiſton, which is diſcharged from it to the air in the lungs.

This diſcovery has ſince been proſecuted by ſeveral ingenious phyſiologiſts. It had been ſhown by profeſſors Black and Irvine, that different bodies have different capacities for containing fire; *e. g.* that oil and water, when equally hot to the ſenſe and the thermometer, contain different proportions of that principle; and that unequal quantities of it are required, in order to raiſe thoſe ſubſtances to like temperatures. The enquiries of Dr. Crawford and Mr. Elliot tend to prove, that the capacities of bodies for containing fire are diminiſhed by the addition of phlogiſton, and increaſed by its ſeparation. Common air contains a great quantity of fire; combuſtible bodies very little. In conbuſtion, a double elective attraction takes place; the phlogiſton of the body being transferred to the air, and the fire contained in the air to the combuſtible body. But as the capacity of the latter is not increaſed ſo much as that of the former is diminiſhed, only part of the extricated fire will be abſorbed by the body. The remainder therefore will raiſe the temperature of the compound; and hence we may account for the heat attending combuſtion. As the uſe of reſpiration is to dephlogiſticate the blood, it ſeems probable that a like double elective attraction takes place in this proceſs; the phlogiſton of the blood being transferred to the air, and the fire contained in the air to the blood; but with this difference, that the capacities being equal, the whole of the extricated fire is abſorbed by the latter. The blood in this ſtate, circulating through the body, imbibes phlogiſton, and of courſe gives out its fire; part only of which is abſorbed by the parts furniſhing the phlogiſton, the remainder, as in combuſtion, becoming ſenſible; and is therefore the cauſe of the heat of the body, or what is called *animal heat*.

Next to the preſervation of life, the moſt important uſe of reſpiration ſeems to be, that of forming the *voice* and ſpeech. The ancients and almoſt all the moderns have conſidered the organ of ſpeech as a kind of muſical inſtrument, which may be compared to a flute, an hautboy, an organ, &c. and they argue after the following manner. The trachea, which begins at the root of the tongue, and goes to terminate in the lungs, may be compared to the pipe of an organ, the lungs dilating like bellows during the time of inſpiration; and as the air is driven out from them in exſpiration, it finds its paſſage ſtraightened by the cartilages of the larynx, againſt which it ſtrikes. As theſe cartilages are more or leſs elaſtic, they occaſion in their turn more or leſs vibration in the air, and thus produce the ſound of the voice; the variation in the ſound and tone of which depends on the ſtate of the glottis, which, when ſtraitened, produces an acute tone, and a grave one when dilated. Several ingenious theories have been founded on theſe principles, but none that we have yet ſeen appear fully ſatisfactory.

SECT. V. *Of the* PERICARDIUM *and the* HEART, *with its* VENTRICLES *and* AURICLES.

I. The PERICARDIUM is a ſtrong membranous capſule, which incloſes the heart in a two-fold manner; for, after ſurrounding the heart, it is itſelf ſurrounded by a reflexion of its own ſubſtance. It is made up of three laminæ, the middle and chief of which is compoſed of very fine tendinous filaments, cloſely interwoven, and croſſing each other in different directions. The internal lamina ſeems to be a continuation of the outer coat of the heart, auricles, and great veſſels. The uſes of the pericardium are, to keep the heart in its place without interrupting its office; to keep it from having any injurious friction with the lungs; and to contain a liquor to lubricate its own ſurface and that of the heart, ſo as to prevent the friction which would otherwiſe happen between both. This is a coagulable lymph, and is called *liquor pericardii*.

The arteries of the pericardium are derived from the phrenic.

phrenic, and its veins paſs into veins of the ſame name; its nerves are likewiſe branches of the phrenic. The ſize of the pericardium is adapted to that of the heart, being uſually large enough to contain it looſely. As its cavity does not extend to the ſternum, the lungs cover it in inſpiration; and as it every where inveſts the heart, it effectually ſecures it from being injured by lymph, pus, or any other fluid, extravaſated into the cavities of the thorax.

II. The HEART is a hollow muſcle of a conical ſhape, ſituated tranſverſely between the two laminæ of the mediaſtinum, at the lower part of the thorax; having its baſis turned towards the right ſide, and its point or apex towards the left. Its lower ſurface is ſomewhat flattened towards the diaphragm. Its baſis, from which the great veſſels originate, is covered with fat, and it has two hollow and fleſhy appendages, called *auricles*. Round theſe ſeveral openings, the heart ſeems to be of a firm ligamentous texture, from which all its fibres originate; and as they advance from thence towards the apex, the ſubſtance of the heart ſeems to become thinner.

III. The heart includes two VENTRICLES, or cavities which are ſeparated from each other by a fleſhy ſeptum; one of theſe is called the *right*, and the other the *left ventricle*. The heart is externally covered by a very fine membrane; and its ſtructure is perfectly muſcular or fleſhy, being compoſed of fibres paſſing in different directions; ſome longitudinally from the baſis to the apex; others in an oblique or ſpiral courſe; and a third ſort placed in a tranſverſe direction.

Within the two ventricles we obſerve ſeveral furrows; and there are likewiſe tendinous ſtrings, which ariſe from fleſhy *columnæ* in the two cavities, and are attached to the valves of the auricles. That the uſe of theſe and the other valves of the heart may be underſtood, it muſt be obſerved, that four large veſſels paſs out from the baſis of the heart, viz. two arteries and two veins; and that each of theſe veſſels is furniſhed with a thin membranous production, which is attached all round to the borders of their ſeveral orifices, from whence hanging looſely down they appear to be divided into two or three diſtinct portions. But as their uſes in the arteries and veins are different, ſo they are differently diſpoſed. Thoſe of the arteries are intended to give way to the paſſage of the blood into them from the ventricles, but to oppoſe its return; and, on the contrary, the valves of the veins are conſtructed ſo as to allow the blood only to paſs into the heart.

In conſequence of theſe different uſes, we find the valves of the pulmonary artery and of the aorta attached to the orifices of thoſe veſſels, ſo as to have their concave ſurfaces turned towards the artery; and their convex ſurfaces, which mutually meet together, being placed towards the ventricle, only permit the blood to paſs one way, viz. into the arteries. There are uſually three of theſe valves belonging to the pulmonary artery, and as many to the aorta; and from their figure they are called *valvulæ semilunares*. The communication between the two great veins and the ventricles is by means of the two appendages or auricles, into which the blood is diſcharged; ſo that the other valves which may be ſaid to belong to the veins are placed in each ventricle, where the auricle opens into it.

The valves in the right ventricle are uſually three, and are named *valvulæ tricuſpides*; but in the left ventricle we commonly obſerve only two, and theſe are the *valvulæ mitrales*. The membranes which form theſe valves in each cavity are attached ſo as to project ſomewhat forward; and both the *tricuſpides* and the *mitrales* are connected with the tendinous ſtrings, which were deſcribed as ariſing from the fleſhy *columnæ*.

By the contraction of either ventricle, the blood is driven into the artery which communicates with that ventricle; and theſe tendinous ſtrings being gradually relaxed, as the ſides of the cavity are brought nearer to each other, the valves naturally cloſe the opening into the auricle, and the blood neceſſarily directs its courſe into the then only open paſſage, which is into the artery; but after this contraction, the heart becomes relaxed, the tendinous ſtrings are again ſtretched out, and, drawing the valves of the auricle downwards, the blood is poured by the veins into the ventricle, from whence, by another contraction, it is again thrown into the artery. The right ventricle is not quite ſo long, though ſomewhat larger than the left; but the latter has more ſubſtance than the other: and this ſeems to be, becauſe it is intended to tranſmit the blood to the moſt diſtant parts of the body, whereas the right ventricle diſtributes it only to the lungs.

IV. The AURICLES are two muſcular bags, ſituated at the baſis of the heart, at the ſides of each other; and, correſponding with the two ventricles, are like thoſe two cavities diſtinguiſhed into *right* and *left*. Theſe ſacs, which are interiorly unequal, have externally a jagged appendix; which, from its having been compared to the extremity of an ear, has given them their appellation of auricles.

From the par vagum and intercoſtals the heart is ſupplied with nerves. The arteries which are diſtributed to it, ariſe from the aorta, and are called *coronary arteries*. From theſe the blood is returned into the auricles by the *coronary veins*.

SECT. VI. *Of the* ACTION *of the* HEART, AURICLES, *and* ARTERIES.

The heart, at the time it contracts, drives the blood from its ventricles into the arteries; and the arteries being thus diſtended, are naturally inclined to contract the moment the heart begins to dilate, and ceaſes to ſupply them with blood. Theſe alternate motions of contraction and dilatation of the heart and arteries, are diſtinguiſhed by the names of *ſyſtole* and *diaſtole*. When the heart is in a ſtate of ſyſtole, or contraction, the arteries are at that inſtant diſtended with blood, and in their diaſtole; and it is in this ſtate we feel their pulſatory motion, which we call the PULSE. When the heart dilates, and the arteries contract, the blood is impelled onwards into the veins, through which it is returned back to the heart. While the heart, however, is in its ſyſtole, the blood cannot paſs from the veins into the ventricles, but is detained in the auricles, which are two reſervoirs formed for this uſe till the diaſtole, or dilatation of the heart, takes place; and then the diſtended auricles contract, and drive the blood into the ventricles: ſo that the auricles have an alternate ſyſtole and diaſtole as well as the heart.

Though both the ventricles contract at the ſame time, yet the blood paſſes from one to the other. In the ſame mo ment, for inſtance, that the left ventricle drives the blood into the aorta, the right ventricle impells it into the pulmonary artery, which is diſtributed through all the ſubſtance of the lungs. The blood is afterwards brought back into the left ventricle by the pulmonary vein, at the ſame time that the blood is returned by the cava, into the right ventricle, from all the other parts of the body. This ſeems to be the mode of action of the heart and its veſſels.

The cauſe of this action has, like all other intricate and intereſting ſubjects, been differently explained. It ſeems to depend on the ſtimulus made on the different parts of the heart by the blood itſelf, which by its quantity of heat, or other properties, is perhaps capable of firſt exciting that motion, which is afterwards continued through life, independent of the will, by a return of blood to the auricles, in a quantity proportioned to that which is thrown into the arteries. The heart poſſeſſes the *vis insita*, or principle of irritability, in a much greater degree than any other muſcle of the body. The pulſe is quicker in young than in old ſubjects, becauſe the former are *cæt. par.* more irritable than the latter. Upon the ſame principle we may explain, why the pulſe is conſtantly quicker in weak than in robuſt perſons.

The FORCE which the heart exerts at every ſyſtole, has been computed by Borelli, to be equal to 3000lb. weight; that, which all the arteries exert at every ſyſtole, is equal to 16,000lb. weight; and that the heart and arteries together overcome a force equal to 136,000lb. weight; whilſt Dr. Keill has computed, that the heart in every ſyſtole, exerts a force not exceeding eight ounces. The firſt computation was made by comparing the heart, with other muſcles, whoſe power to ſuſtain a weight could be beſt determined; and the latter was made from the velocity of the blood moving in an artery. If, therefore, we conſider that Borelli's way of computing led him to find out the abſolute force of the heart, and Dr. Keill's the force which the heart uſually exerts, perhaps theſe very different computations may be accounted for; for if the force of the heart, which is conſtantly exerted, ſhould, compared with any other muſcle, be put in a reciprocal proportion to the frequency of their actions, and the importance of their uſes; may not the heart very fitly have a force vaſtly greater than uſually it exerts, becauſe it is always in action, and muſt be able to exert a certain force in the loweſt ſtate of health?

What force the heart ever exerts in a grown man, it is difficult to ſay; but it muſt be leſs in each ventricle than is ſufficient to burſt the valves, which hinder the blood from returning into the auricles out of the ventricles, or than is ſufficient to break thoſe threads by which theſe valves are tied to the papillæ. Experiments made upon living animals ſufficiently evince the impulſe and rapidity, with which the blood is moved, particularly through the arteries. The height to which blood aſcended from the carotids, when cut, according to Hale's calculation, Dr. Wriſberg ſaw confirmed in robuſt men who were beheaded. It is generally about ſeven feet, with this difference, however, that in two examples the blood ſprung higher from the vertebrals than from the carotids. In the larger trunks it runs ſwifteſt, but in the leaſt of them ſomewhat ſlower. In the larger veins, the celerity of the blood is leſs than thoſe of the veins, *i. e.* twice or almoſt thrice as ſlow. The motion of the blood through the veins is uniform or equable; but in the arteries, it is alternately greater when the veſſel is more dilated, and leſs when it is contracted. This indeed is proved by occular inſpection in living animals.

SECT. VII. *Of the* NATURE *and* CIRCULATION *of the* BLOOD.

Dr. HARVEY long ago ſuggeſted, that the blood is poſſeſſed of a LIVING PRINCIPLE; and the late Mr. J. Hunter endeavoured to revive this doctrine; in ſupport of which he adduced many ingenious arguments. Dr. James Corrie has alſo publiſhed *An Essay on the Vitality of the Blood*, wherein he urges many ſtrong arguments in ſupport of this opinion. The doctrine appears likewiſe to be confirmed by ſcripture, where the vital principle of the blood is aſſigned as a reaſon for prohibiting the eating of it: "But fleſh with the *life* thereof, which is the *blood* thereof, ſhall you not eat." The ſubject is curious, and deſerves to be proſecuted, as an inquiry which cannot but be intereſting to *phyſiologiſts*.

Blood, recently drawn from a vein, would ſeem to be an homogeneous fluid of a red colour; but when ſuffered to reſt, it ſoon coagulates and divides into two parts, which are diſtinguiſhed by the names of *craſsamentum* and *serum*. The craſſamentum is the red coagulum, and the ſerum is the water in which it floats. Each of theſe may be again ſeparated into two others; for the craſſamentum, by being repeatedly waſhed in warm water, gives out all its red globules, and what remains appears to be compoſed of the coagulable lymph, which is a gelatinous ſubſtance, capable of being hardened by fire till it becomes perfectly horny; and if we expoſe the ſerum to a certain degree of heat, part of it will be found to coagulate like the white of an egg, and there will remain a clear and limpid water, reſembling urine both in appearance and ſmell. Till of late the *coagulable lymph* has been confounded with the *serum* of the blood, which contains a ſubſtance that is likewiſe coagulable, though only when expoſed to heat, or combined with certain chemical ſubſtances; whereas the other coagulates ſpontaneouſly, when expoſed to the air or to reſt. The ſerum and craſſamentum differ in their proportion in different conſtitutions; in a ſtrong perſon, the craſſamentum is in a greater proportion to the ſerum than in a weak one; and the ſame difference is found to take place in diſeaſes.

When the blood ſeparates into *serum* and *craſsamentum*, if the latter be covered with a cruſt of a whitiſh or buff colour, it has been uſually conſidered as a proof of the blood being in a ſtate of too great viſcidity. This appearance, commonly taking place in inflammatory diſeaſes, has long ſerved to confirm the theory, which aſcribes the cauſes of inflammation to lentor and obſtructions. But from the late Mr. Hewſon's experiments it appears, that when the action of the arteries is increaſed, the blood, inſtead of being more viſcid, is, on the contrary, more fluid than in the ordinary ſtate, previous to inflammation: and in conſequence of this, the coagulable lymph ſuffers the red globules, which are the heavieſt part of the blood, to fall down to the bottom before it coagulates; ſo that the craſſamentum is divided into two parts; one of which is found to conſiſt of the coagulable lymph alone (in this caſe termed the *buff*;) and the other, partly of this, and partly of the red globules.

By putrefaction alone, or the diſſolving power of the air, in a heat equal to 96 degrees, the whole maſs, but eſpecially the ſerum, diſſolves into a fœtid liquor; the ſerum, firſt, and the cruor more ſlowly, till at length the whole maſs, both of ſerum and cruor, is turned into a volatile and fœtid exhalation, leaving very few fæces behind. The blood, being a little diſſolved by the beginning putrefaction, becomes fœtid; with the fœtor it aſſumes an alkaline nature, and efferveſces with acids. This property it afterwards loſes, the alkaline ſalt being deſtroyed by the complete putrefaction. The putrid blood cannot by any art be inſpiſſated, and it is very difficult to reſolve it, after it has been coagulated by ſpirit of wine. By too ſevere exerciſe, heat, and malignant diſorders, the coheſion of the blood is diſſolved, and it aſſumes an alkaline nature, almoſt as if from putrefaction.

The blood contains in its ſubſtance a quantity of *sea salt*, which is diſcernible to the taſte, and ſometimes viſible by the microſcope. That there is *earth* in the blood is demonſtrated from nutrition, and from a chemical analyſis; and this earth is chiefly found in the moſt fluid, and eſpecially in the oily parts of the blood. By ſome late experiments, it appears, that a conſiderable quantity of ferruginous earth, eaſily reducible into metal by the addition of phlogiſton, is contained in blood when calcined. Another part of the blood is *air* in an unelaſtic ſtate, and that in a very conſiderable quantity, as is proved by putrefaction and diſtillation, or by removing the ambient air by the pump; but we are not to ſuppoſe that the blood globules are bubbles full of air, for they are ſpecifically heavier than the ſerum. By the admixture of neutral ſalts the colour of the blood becomes deeper and brighter, without its being either diſſolved or thickened. It is ſcarcely altered by a weak acid. By fermented liquors it is coagulated. Fixed alkaline ſalts have almoſt the ſame effect as neutral. The volatile alkalies rather turn it brown, and coagulate it. Alcohol, diſtilled oils, and vinegar, coagulate it. It does not efferveſce with and ſalt.

After what has been obſerved of the ſtructure and action of the heart and its auricles, there ſeem to be few arguments required to demonſtrate the CIRCULATION *of the blood*, which has long ago been eſtabliſhed as a medical truth. This circulation may be defined to be a perpetual motion of the blood, in conſequence of the action of the heart and arteries, which impel it through all the parts of the body, from whence it is brought back by the veins to the heart. A very ſatisfactory proof of this circulation, and a proof eaſy to be underſtood, may be deduced from the different effects of preſſure on an artery and a vein. If a ligature is paſſed round an artery, the veſſel ſwells conſiderably between the ligature and the heart; whereas if we tie up a vein, it only becomes filled between the extremity and the ligature, and this is what we every day obſerve in bleeding. The ligature we paſs round the arm on theſe occaſions, compreſſes the ſuperficial veins; and the return of the blood through them being impeded, they become diſtended. When the ligature is too looſe, the veins are not ſufficiently compreſſed, and the blood continues its progreſs towards the heart; and, on the contrary, when it is made too tight, the arteries themſelves become compreſſed; and the flow of the blood through them being impeded, the veins cannot be diſtended.

Another effectual proof of the circulation, is the loſs of blood that every living animal ſuſtains, by opening only a ſingle artery of a moderate ſize; for it continues to flow from the wounded veſſel till the equilibrium is deſtroyed which is eſſential to life. This truth was not unknown to the ancients; and it ſeems ſtrange, that it did not lead them to a knowledge of the circulation, as it ſufficiently proves, that all the other veſſels muſt communicate with that which is opened. Galen, who lived more than 1500 years ago, drew this concluſion from it; and if we farther obſerve, that he deſcribes, (after Eraſiſtratus, who flouriſhed about 450 years before him) the ſeveral valves of the heart, and determines their diſpoſition and uſes, it will appear wonderful, that a period of near 2000 years ſhould afterwards elapſe before the true courſe of the blood was aſcertained. This diſcovery, for which we are indebted to the immortal Harvey, has thrown new lights on phyſiology, and the doctrine of diſeaſes, and conſtitutes one of the moſt important periods of anatomical hiſtory.

PART VI. ANGEIOLOGY.

INTRODUCTORY REMARK.

ANGEIOLOGY has hitherto been reſtricted, by moſt anatomiſts, to the deſcription of the BLOOD VESSELS, though the literal meaning of the word admits of no ſuch reſtriction. The word *Angeiologia* is Greek, and compounded of two words, the firſt of which denotes a *vessel*, and the ſecond a *description;* and, therefore, ſignifies a deſcription of veſſels *in general.* As we can perceive no reaſon for this reſtricted application of the word, unleſs it be that Galen applied it to the doctrine of the blood veſſels, at a period when a great number of thoſe veſſels, ſince diſcovered in the human body, were quite unknown, we mean to uſe it in its original and extenſive ſenſe; by comprehending not only the blood veſſels, but likewiſe the Lacteals, Lymphatics, and other branches of the abſorbent ſyſtem, under this diviſion of our ſubject.

SECT. I. *Of the* ARTERIES *and* VEINS.

We have already obſerved, (part v. ſect. vi.) that the heart contracts itſelf, and throws the blood from its two ventricles into the pulmonary artery and the aorta, and then relaxes itſelf and receives a freſh ſupply from the pulmonary vein and the vena cava. We will now point out the principal diſtributions of the blood veſſels.

From the right ventricle of the heart ariſes the PULMONARY ARTERY, which ſoon divides into two branches, one to each lobe of the lungs. They then ſubdivide into ſmaller and ſmaller branches, until they are diſtributed through every part of the lungs. From the extreme branches of the pulmonary artery ariſe the ſmall branches of the pulmonary veins; which, as they approach the left auricle of the heart, unite in a manner ſimilar to the ramifications of the pulmonary artery in its egreſs from the heart; except that the veins enter the muſcular appendix of the left auricle in ſeveral branches, and the blood being brought back from the lungs by theſe veſſels to the left auricle and ventricle of the heart, is from the left ventricle of the heart thrown into the aorta.

The AORTA, or GREAT ARTERY, ariſes from the left ventricle of the heart, and deals out branches to every part of the body. The firſt part of this veſſel is called aorta aſcendens. It paſſes over the left pulmonary artery, and veins, and branch of the trachea, and being reflected under the left lobe of the lungs, it commences aorta deſcendens; which name it keeps through the thorax and abdomen, where it paſſes on the left ſide of the ſpine, till its diviſion into the iliac arteries between the third and fourth vertebræ of the loins.

From beneath two of the ſemilunar valves of the aorta, and ere it leaves the heart, ariſe two branches, which are beſtowed upon the heart itſelf, as we juſt now obſerved, and which are called CORONARIÆ CORDIS. From the curved part of the aorta, which is about two or three inches above the heart, ariſe the ſubclavian and carotid arteries; the right ſubclavian and carotid in one trunk, but the left ſingle.

The CAROTID ARTERIES run on both ſides the larynx to the ſixth foramina of the ſkull, through which they enter and proceed to the brain; but as they paſs through the neck, they detach branches to all the adjoining parts. Theſe branches are called by the names of the parts they are beſtowed upon; as, laryngeæ, thyroidæ, pharyngeæ, linguales, temporales, occipitales, faciales &c. but juſt before they enter the ſixth foramina of the ſkull, they each ſend a ſmall branch through the fifth foramina to that part of the dura mater, which contains the cerebrum. Theſe arteries make thoſe impreſſions that are conſtantly obſerved on the oſſa bregmatis: theſe branches however, often ariſe from the temporal arteries.

The INTERNAL CAROTIDS ſend two branches to the back part of the noſe, and ſeveral branches through the firſt and ſecond foramina of the ſkull to the face and parts contained within the orbits of the eyes, and then piercing the dura mater, they each divide into two branches, one of which they ſend under the falx of the dura mater, between the two hemiſpheres of the brain, and the other between the anterior and poſterior lobes. Theſe branches take a great many turns, and divide into very ſmall branches in the pia mater, before they enter the brain, becauſe the pulſe of the larger arteries would make too violent an impreſſion on ſo tender and delicate a part.

Beſides the carotids, the brain has other two arteries, called CERVICALES, which ariſe from the ſubclavian arteries, and aſcend to the head through the foramina, in the tranſverſe proceſſes of the cervical vertebræ, and into the ſkull through the tenth or great foramen. Theſe two arteries uniting ſoon after their entrance, ſend branches to the cerebellum, and then paſſing forwards, divide and communicate with the carotids; and the carotid arteries anaſtomoſing with each other, there is an entire communication between them all; and theſe interpoſing branches are ſo large that every one of theſe four great veſſels, with all their branches, may be eaſily filled with the common wax injections through any one of them.

The SUBCLAVIAN ARTERIES are each continued to the cubit in one trunk, which is called *axillaris* as it paſſes the arm pits, and *humeralis* as it paſſes by the inſide of the os humeri, between the muſcles that bend and extend the elbow. From the ſubclavians within the breaſt ariſe the *arteriæ mammariæ*, which run on the inſide of the ſternum, and lower than the cartilago enſiformis. Soon after the arteria humeralis has paſſed the joint of the cubit, it divides into two branches, called *cubitalis superior* and *cubitalis inferior*; which latter ſoon ſends off a branch called *cubitalis media*, which is beſtowed upon the muſcles ſeated above the elbow.

The CUBITALIS SUPERIOR paſſes near the radius, and round the root of the thumb, and gives one branch to the back of the hand, and two to the thumb; one to the firſt finger, and a branch to communicate with the cubitalis inferior. The CUBITALIS INFERIOR paſſes near the ulna to the palm of the hand, where it takes a turn, and ſends one branch to the outſide of the little finger; another between that and the next finger, dividing to both; another in the ſame manner to the two middle fingers; and another to the two fore fingers. Theſe branches, which are beſtowed on the fingers, run one on each ſide of each finger internally to the top, where they have ſmall communications, and very often there is a branch of communication between the humeral and inferior cubital arteries. This communicant branch is ſometimes very large, and liable to be pricked in opening the baſilic vein, immediately under which, this branch almoſt always lies. See Plate VII. ARTERIES.

From the deſcending aorta on each ſide, is ſent a branch under every rib, called INTERCOSTALIS, and about the fourth vertebra of the back, it ſends off two branches to the lungs, called *bronchiales*, which are ſometimes both given off from the aorta, ſometimes one of them from the intercoſtal of the fourth rib on the right ſide. As the aorta paſſes under the diaphragm, it ſends two branches into the diaphragm, called *arteriæ phrenicæ*, which ſometimes riſe in one trunk from the aorta, and ſometimes from the cœliac. Immediately below the diaphragm ariſes the *cœliac artery* from the aorta. It ſoon divides into ſeveral branches, which are beſtowed upon the liver, pancreas, ſpleen, ſtomach, omentum, and duodenum. *Theſe branches* are named from the parts they are beſtowed on, except two that are ſent to the ſtomach, and which are called *coronaria superior* and *inferior*, and the branch running on the duodenum, which is named *inteſtinalis*.

At a very ſmall diſtance below the arteria cœliaca from the aorta, ariſes the MESENTERICA SUPERIOR, whoſe branches are diſtributed upon the whole of the inteſtinum jejunum and ilium, part of the colon, and ſometimes one branch upon the liver. A little lower than the ſuperior meſenteric artery ariſe the *emulgents*, which are the arteries of the kidneys; and a little lower than the emulgents, anterior to the aorta, ariſe the *arteriæ ſpermaticæ*, which are diſtributed to the genital parts in men. Laterally, and lower down, the aorta ſends branches to the loins, called *lumbales*; and one forward, to the lower part of the colon and the rectum, called *meſenterica inferior*. Between the arteria cœliaca, meſenterica ſuperior and inferior, and the branches of each near the inteſtines, there are large communicant branches to convey the blood from one to another, when they are either compreſſed by excrements, or from any other cauſe.

The aorta, as ſoon as it divides upon the loins, ſends off an artery into the pelvis upon the os ſacrum, called *arteria ſacra*; and the branches into which the aorta divides, are called *iliacæ*. Theſe again, at about the diſtance of two inches, divide into external and internal. The iliacæ internæ firſt ſend off the umbilical arteries, which are obliterated in adult bodies, except at their beginnings, which are kept open for the collateral branches on each ſide, one to the bladder, and one to the penis in men, and in women to the uterus. The reſt of theſe branches are beſtowed upon the glutæi muſcles, and upper part of the thighs. The iliacæ externæ run over the oſſa pubis into the thighs; and as they paſs out of the abdomen, they ſend off branches, called *epigaſtricæ*, to the fore part of the integuments of the abdomen, under the recti muſcles. The epigaſtric arteries ſend each a branch into the pelvis, and through the foramina of the oſſa innominata, to the muſcles thereabouts.

As ſoon as the iliac artery has paſſed out of the abdomen into the groin, it is called *inguinalis*, and in the thigh *cruralis*. Here it ſends a large branch to the back part of the thigh; but the great trunk is continued internally between the flexors and extenſors of the thigh, and paſſing through the inſertion of the triceps muſcle into the ham, it is there called *poplitea*. It then, below the joint, divides into two branches, one of which is called *tibialis antica*, which paſſes between the tibia and fibula down the fore part of the leg, and is beſtowed upon the great toe, and one branch to the toe next to the great one, and another between theſe toes, to communicate with the *tibialis poſtica*; which artery, ſoon after it is divided from the antica, ſends off the *tibialis media*, which is beſtowed upon the muſcles of the leg. The tibialis poſtica goes to the bottom of the foot and all the leſſer toes. The tibialis antica is diſpoſed like the cubitalis ſuperior; the poſtica like the cubitalis inferior; and the mediæ in each have alſo like uſes. Theſe arteries are uniform in moſt bodies, but the leſſer branches are diſtributed like the branches of trees, in ſo different a manner in one body from another, that it is highly probable no two bodies are exactly alike, nor even the ſides in any one ſubject.

The VEINS ariſe from the extremities of the arteries, and compoſe trunks which accompany the arteries in almoſt every part of the body, and bear the ſame names. The veins of the brain unload themſelves into the ſinuſes, and the ſinuſes into the internal jugulars and cervicals; and the internal jugulars and cervicals into the ſubclavians, which joining, make the cava deſcendens. The internal jugulars are ſeated near the carotid arteries, and receive the blood from all the parts which are ſupplied by the carotids, except the hairy ſcalp and part of the neck, whoſe veins enter into the external jugulars, which run immediately under the muſculus quadratus genæ, often two on each ſide.

The CERVICAL VEINS deſcend, two through the foramina in the tranſverſe proceſſes of the cervical vertebræ, and two through the great foramen of the ſpine, and on each ſide the ſpinal marrow. Theſe join at the loweſt vertebra of the neck, and then empty into the ſubclavians, and at the interſtices of all the vertebræ communicate with each other.

The VEINS *of the* EXTREMITIES are more than double the number of the arteries, there being one placed on each ſide of each artery, even to the ſmalleſt branches that we can trace, beſides the veins which lie immediately under the ſkin. Thoſe which accompany the arteries, have the ſame names with the arteries. Thoſe which run immediately under the ſkin on the back of the hand, have no proper names; they run from thence to the bend of the elbow, where the uppermoſt is called *cephalica*, the next *mediana*, and the laſt *baſilica*. Theſe all communicate near the joint of the elbow, and then ſend one branch which is more directly from the cephalica, and bears that name until it enters the *ſubclavian* vein. It paſſes immediately under the ſkin, in moſt bodies, between the flexors and extenſors of the cubit, on the upper ſide of the arm. The other branches joining, and receiving thoſe which accompany the arteries of the cubit, they paſs with them by the artery of the arm into the ſubclavian vein. The *cephalic* vein, as it runs up the arm, is very viſible in moſt men, but in children is rarely to be ſeen.

In the thorax, beſides the two cavæ, there is a vein called AZYGOS, or *vena ſine pari*. It is made up of the intercoſtal, phrenic, and bronchial veins, and enters the deſcending cava near the auricle, as if its uſe was to divert the deſcending blood from falling too directly upon the blood in the aſcending cava, and to direct the blood of the deſcending cava into the auricle.

In the abdomen, beſides the cava aſcendens, and other veins which are named like the arteries, there is one large vein, called VENA PORTÆ. Its branches ariſe from all thoſe of the cœliac and two meſenteric arteries, except thoſe branches of the cœliac and ſuperior meſenteric, which are beſtowed on the liver, and uniting in one trunk, enter the liver. In this ſituation it is again diſtributed like an artery and has its blood collected and brought into the cava by the branches of the cava in the liver; this vein being made uſe of inſtead of an artery to carry blood to the liver, for the ſeparation of bile. The blood moves here conſideraly ſlower than in the arteries, this ſlow circulation being probably neceſſary for the ſecretion of the bile.

In the leg the veins accompany the arteries, in the ſame manner as in the arm, the external veins of the foot being on the upper ſide; and from them is derived one called *ſaphena*, which is continued on the inſide of the limb through its whole length, and has different names given it according to the different places through which it paſſes.

The ARTERIES have *three coats* each; the middle one muſcular, and the external and internal, membranous. The VEINS are ſaid to have the ſame, though this is to be doubted. The internal coat of an artery may be pretty eaſily ſeparated, but not the external; but though the veins have muſcular fibres, it is not very poſſible to ſeparate any one of them diſtinctly into three coats. In the inſide of the veins there are many valves, eſpecially in the lower extremities. Theſe hinder any reflux of the venal blood, which otherwiſe would happen from the frequent actions of the muſcles on the outſides of the veins. Both the arteries and veins, as they run on the inſide of the limb, or as they appear in parts that are liable to great diſtenſion, as the ſtomach, inteſtines, uterus, &c. are curved in ſuch a manner, as to comply with thoſe diſtenſions by being merely ſtraightened, and without being leſſened in their diameters.

The ſmall arteries near the heart go off from the large trunks at obtuſe angles, farther at leſs obtuſe angles, then at right angles, farther ſtill at acute angles, and near the extremities at very acute angles; becauſe the blood in the veſſels far from the heart, moving with leſs velocity than the blood in the veſſels near the heart, the blood in the collateral branches more remote from the heart wants the advantage of a more direct courſe: and becauſe a very large branch ariſing out of another, might weaken too much the ſides of the veſſel it would ariſe from, that inconvenience is prevented by increaſing the number, and ſo leſſening the ſize of the collateral branches, where otherwiſe one large branch would have ſerved better; as in the going off of the ſubclavian and carotid arteries, which might have gone off for ſome ſpace in one trunk; but this mechaniſm is moſt evident in the going off of the arteria cœliaca and meſenterica ſuperior. The ſmall arteries always divide ſo, as that the leſſer branch may be leaſt in the direction of the blood flowing into them, which makes the blood flow moſt freely into that branch that has fartheſt to carry it; and the ſmaller branches ariſe more or leſs obliquely from the ſides of other arteries, according to the proportion they bear to the arteries they ariſe from; becauſe an artery comparatively large ariſing obliquely from the ſide of another, would make an orifice in that it ariſes from too large, and weaken it. Both theſe ends are at once brought about, by making the arteries, that give off the branches, bend more or leſs towards the branches they afford, according to the comparative magnitude of the branches given off.

SECT. II. *Of the* ABSORBENT SYSTEM *in* GENERAL.

The abſorbent ſyſtem conſiſts of the lacteals, the lymphatic veſſels, the thoracic duct, which is their common trunk, and the conglobate glands.

I. The LACTEALS begin from the inteſtinal tube, and can generally be ſeen in any large quadruped that is killed two or three hours after eating. They then appear filled with a white chyle; but they do not always contain a fluid of this colour; for, if the animal be opened long after a meal, they are found diſtended with a liquor that is tranſparent and colourleſs like the lymph. In birds the chyle is never found white, but always tranſparent; ſo that theſe veſſels might, with ſome propriety, be called the *lymphatics of the inteſtines*.

II. The LYMPHATIC VESSELS are ſmall pellucid tubes, that exiſt in moſt parts of the human body. Their fluids are generally as colourleſs as water; a circumſtance which procured them at firſt the name of *ductus aquoſi*, and afterwards that of *vaſa lymphatica*. The courſe of the lymph, like that of the chyle, is from the extreme parts of the body towards the centre, and many of the lymphatic veſſels lie cloſe to the large blood veſſels. If therefore a ligature be made on the blood veſſels of the extremities of a living animal, or of one juſt dead, that ligature, by embracing the lymphatics, will ſtop the courſe of the lymph, which by diſtending the veſſels will make them viſible below the ligature. All the lacteals, and moſt of the lymphatic veſſels, open into the thoracic duct, which lies upon the ſpine, and runs up towards the neck, where it commonly opens into the angle between the internal jugular and ſubclavian veins of the left ſide; and thus both the chyle and lymph are mixed with the blood. See Pl. VIII. fig. 4. If therefore a ligature be made on the thoracic duct immediately after killing an animal, not only the lacteals, but alſo the lymphatic veſſels, in the abdomen and lower extremities, become diſtended with their natural fluids, the courſe of thoſe fluids being ſtopped by the ligature.

III. The lacteals, the lymphatic, and the THORACIC DUCT, have their coats thinner and more pellucid than thoſe of the blood veſſels. But though their coats are ſo thin, they are very ſtrong, as we daily ſee on injecting them with mercury, ſince they reſiſt a column of that fluid, the weight of which would burſt the blood veſſels. This thinneſs prevents our dividing them from one another, and thereby aſcertaining their number, as we do thoſe of the blood veſſels. But as the blood veſſels have a denſe internal coat, to prevent tranſudation, we have reaſon to believe the lymphatics have the ſame. And as the blood veſſels have a muſcular coat, which aſſiſts in the circulation; ſo may the lymphatics.

This is rendered probable from what Haller ſays of his having found them irritable in his experiments, and alſo from what is obſerved on ſeeing them, in living animals diſtended with their lymph, in which caſe they appear of a conſiderable ſize; but upon emptying them, they contract ſo much as not to be eaſily diſtinguiſhed. This experiment, Mr. Hewſon informs us, he frequently made in the trunk of the lacteals in a gooſe, and on the lymphatic veſſels on its neck; both of which, when diſtended with their natural fluids, are as large as a crow quill; but, upon emptying them in the living animal, he has ſeen them contract ſo much that it was with the greateſt difficulty he could diſtinguiſh them from the fibres.

The COATS of the lymphatic veſſels have, in common with all other parts of the body, arteries and veins, for their nouriſhment. This is rendered probable by their being ſuſceptible of inflammation; for they are frequently found in the form of a cord, painful to the touch, and extending from an ulcer to the next lymphatic gland. Theſe painful ſwellings of lymphatic veſſels likewiſe ſhow that their coats have ſenſibility, and therefore that they have nerves as well as arteries and veins. Beſides, we can clearly trace, in different parts of the body, blood veſſels running along their ſurfaces.

In moſt animals, but particularly in man and quadrupeds, the lymphatic veſſels are full of VALVES. Theſe valves have been deſcribed by the celebrated Nuck, Ruyſch, and others, and are much more frequent than in the common veins, and thence theſe lymphatics have ſometimes been diſtinguiſhed by the name of *valvular lymphatic veſſels*. Theſe valves are generally two in number, of a ſemilunar ſhape, and the one ſometimes much larger than the other. In moſt parts of the body theſe valves are ſo numerous, that there are three or four pair in an inch, but ſometimes there is no more than one pair, and ſometimes ſeveral inches appear without a valve. They are leſs numerous in the thoracic duct than in the branches of the ſyſtem; thence it might be ſuppoſed, that in proportion as we go from the trunk to the branches, we ſhould find them in greater number: but this is not always true, for Mr Hewſon obſerved them more numerous, in the lymphatic veſſels of the thigh.

than on thoſe of the leg. When the veſſels are diſtended with lymph, they appear larger on that ſide of the valves next the heart; which ſometimes gives a lymphatic veſſel an appearance of being made of a chain of veſicles; as ſuch they are repreſented by ſome authors; but it is an appearance that very ſeldom occurs in the human body. In quadrupeds, however, this appearance is very remarkable.—Wherever a lymphatic veſſels enters the thoracic duct or a red vein, we find either one or two valves, which prevent the return of the lymph, or hinder the blood from getting into the lymphatic.

V. The lymphatic ſyſtem, in different parts of its courſe, has the GLANDS called *conglobate*, or LYMPHATIC. Theſe glands are ſo placed, that the veſſels come in on one ſide, and paſs out on the other, in their way to the thoracic duct. They are commonly of an oval, though ſometimes of a round form, and frequently ſomewhat flattened, and of various ſizes, ſome being no larger than a millet ſeed, while others are almoſt an inch in diameter. They vary in colour in different parts of the body, and at different times of life. In young people they are generally of a reddiſh or brown colour; but become paler with age: they have a ſhining external ſurface, which is owing to a ſmooth denſe coat that covers them. Like other glands, they have arteries, veins, and nerves, which enter into their compoſition: but with reſpect to the reſt of their ſtructure, anatomiſts are much divided in opinion; ſome endeavouring to prove that they are formed of cells, while others of equal credit conſider them as a collection of veſſels. Before the diſcovery of the lymphatic veſſels in birds, fiſh, and turtle, ſome anatomiſts conſidered theſe glands as ſo eſſentially neceſſary to the lymphatic ſyſtem, that they generally ſet about diſcovering the veſſels by firſt looking for the glands: and wherever they found glands, they pronounced that there muſt be veſſels; and when no glands could be ſeen, they thought it as certain a proof of there being no veſſels. But that the glands are wanting in ſome animals, is now generally known.

SECT. III. *Of the* LYMPHATICS *of* PARTICULAR PARTS.

From the preceding general deſcription of the Abſorbent Syſtem, it appears, that, beſides the glands, it is divided into 3 parts, viz. the *lacteals*, the *lymphatic veſſels*, and the *thoracic duct*. The lacteals belong to the inteſtinal tube; the lymphatics, to all the other parts of the body; and the thoracic duct is the common trunk which receives both the lacteals and lymphatics. Of theſe a copious deſcription has been given by Dr. William Hunter, Mr. Hewſon, and other anatomiſts, by whoſe induſtry this part of anatomy has been greatly illuſtrated. Since, notwithſtanding their importance in the animal economy, a very minute account of the courſe and number of lymphatic veſſels in each particular part of the body cannot be of any great degree of practical advantage to the ſtudent, we ſhall not purſue the ſuject to any unneceſſary length.

The lymphatics may be divided into two kinds, viz. *ſuperficial* and *deep ſeated*.—The SUPERFICIAL LYMPHATICS conſiſt of numerous veſſels that lie between the ſkin and the muſcles, and belong to the ſurface of the body or the ſkin, and to the cellular membrane which lies immediately under it. Numerous large branches of them can be readily enough diſcovered in the limbs of dropſical ſubjects. Many of them run upon the top of the foot; others are generally to be found juſt under the inner ankle. By means of tubes which have been introduced into two of them, the lymphatics have been filled the whole length of the lower extremity. See Pl. VIII. ABSORBENTS.

The greater number of ſuperficial lymphatics accompany the *vena ſaphena major*. They can be firſt traced from the toes, where they run ſomewhat like the arteries and veins. A plexus, conſiſting of ſeveral veſſels, runs over the top of the foot with the ſaphena to the inner ankle, and from thence upwards to the inner ſide of the knee. Here they are joined by another plexus which ariſes from the ſole, and paſſes up on the inner and back part of the leg. A third plexus ariſes from the outer ſide of the foot, and runs by the outer ankle. Upon the outer part of the leg, theſe ſplit into two diviſions; one of which croſſes obliquely over the fore part of the leg, to the lymphatics at the inner ſide of the knee, while the remaining part accompanies the vena ſaphena minor, and runs to the glandulæ popliteæ. From the inſide of the knee a plexus runs up, conſiſting of from a dozen to twenty trunks, which paſs afterwards on the anterior and inner ſide of the thigh to the inguinal glands. In their paſſage they receive branches from the outer and back parts of the thigh; but theſe are few in number when compared with the reſt.

The lymphatic glands of the GROIN, are ſix, ſeven, eight, or upwards, varying much in number. Of theſe, ſome lie in the very angle between the thigh and the abdomen, and others a few inches down on the fore part of the thigh. The lymphatic veſſels, above deſcribed, enter the lowermoſt of theſe glands. One or more of theſe branches, however, frequently avoids a gland, and afterwards bends over it to another gland; from which veſſels go to other lymphatic glands that lie in the angle between the thigh and the abdomen, and ſometimes a few enter no glands till they reach thoſe on the inſide of Poupart's ligament.

Many lymphatics alſo paſs into the inguinal glands, from the ſuperficial parts of the abdomen and pelvis. It is into theſe upper glands alone, that the lymphatic veſſels of the genitals enter, ſo that the venereal bubo, which ariſes in conſequence of an abſorption of matter from the organs of generation, is always ſeated in thoſe upper glands; and the lower glands are never affected, except by the regurgitation of the matter, or from the vicinity to the glands firſt diſeaſed, which very ſeldom happens. And, as the upper glands are affected by the abſorption of matter from the genitals, ſo the lower are commonly firſt affected from the abſorption of the acrid matter of an ulcer, diſeaſed joint, or carious bone, in the parts below theſe glands; a circumſtance that may aſſiſt us in the diagnoſis of theſe two kinds of buboes: remembering, however, that this rule may be liable to an exception, from one or more of the lymphatic veſſels paſſing the lower glands, and only entering at the upper.

In the penis, three principal veſſels commonly take their origin from the prepuce. Theſe ſoon unite, but afterwards ſeparate upon the middle of the dorſum penis into two parts; one of which goes to the inguinal glands on the right ſide, the other to thoſe of the left. The DEEP-SEATED LYMPHATICS ariſe from the glands and body of the penis, and accompany the arteries into the lower part of the pelvis. Hence if venereal matter be abſorbed by theſe veſſels, the conſtitution may be affected without our being aware of it.

The lymphatic veſſels of the teſticle are numerous, and very large for the ſize of this organ. They ariſe from its coats, from the body of the teſticle, and from the epididymis; and after running along the ſpermatic cord, they terminate in the lumbar glands. In their courſe they have few communications with each other. The lymphatics of the ſcrotum, which are alſo numerous, go chiefly to the glands of the groin, though ſome paſs along with thoſe of the teſticle to the lumber glands.

The lymphatic veſſels of the penis and ſcrotum having joined thoſe of the thigh, a net work is formed, which enters the abdomen under the edge of the tendon of the external oblique muſcle, called *Poupart's ligament*. This plexus on the inſide of Poupart's ligament conſiſts of many branches; ſome of which embrace the iliac artery, but the greateſt number of them paſs upon the inſide of the artery.

The ſuperficial lymphatics of the inferior extremity are the trunks of thoſe veſſels which abſorb from the ſkin and the cellular membrane immediately under it; but they likewiſe communicate with the deep ſeated abſorbents: and the ſame thing is to be obſerved with reſpect to the lymphatics on all the other parts of the ſurface of the body. Upon theſe veſſels, from the foot to the groin, there are commonly no other lymphatic glands than thoſe of the ham. But this rule has ſome exceptions.

SECT. IV. *Of the* LACTEAL SAC *and* DUCT.

We ſhall now proceed to give a deſcription of the LACTEAL SAC *and* DUCT, for a view of which ſee PLATE VIII. *Fig.* 4. The RECEPTACLE *of the* CHYLE is a membranous bag, ſomewhat pyriform, two thirds of an inch long, one third of an inch over in its largeſt part when collapſed; ſituated on the firſt vertebra of the loins to the right of the aorta, a little higher than the right emulgent artery, behind the right inferior muſcle of the diaphragm. It is formed by the union of three tubes; one from under the aorta, the ſecond from the interſtice of the aorta and cava, and the third from under the emulgents of the right ſide.

The LACTEAL SAC, becoming gradually ſmaller towards its upper part, is contracted into a ſlender membranous pipe, of about a line diameter, which is generally named the THORACIC DUCT. This paſſes between the muſcular appendices of the diaphragm, on the right of the aorta. It then mounts between the aorta and the vena azygos as far as the fifth vertebra of the thorax, where it is hid by the azygos, as this vein riſes forwards to join the deſcending or ſuperior cava; after which the duct paſſes obliquely over to the left ſide, behind the œſophagus, aorta deſcendens, and the great curvature of the aorta, until it reaches the left carotid artery; behind which, on the left ſide of the œſophagus, it runs to the interſtice of the firſt and ſecond vertebræ of the thorax, where it begins to ſeparate from the carotid, ſtretching farther towards the left internal jugular vein by a circular turn, whoſe convex part is uppermoſt.

At the top of this arch it ſplits into two branches for a line and an half; the ſuperior branch receiving into it a large lymphatic veſſel from the cervical glands. When the two branches are again united, the duct continues its courſe towards the internal jugular vein, behind which it deſcends, and, immediately at the left ſide of the inſertion of this vein, enters the ſuperior poſterior part of the left ſubclavian vein, whoſe internal membrane being duplicated, forms a ſemilunar valve that is convex externally, and covers two thirds of the orifice of the duct.

The COATS of the ſac and duct are thin tranſparent membranes; from the inſide of which, in the duct, ten or twelve ſmall ſemilunar valves are produced, moſt commonly in pairs; which are ſo ſituated as to allow the paſſage of liquors upwards only. This is the moſt ſimple and common courſe, ſituation, and ſtructure of the receptaculum chyli and thoracic duct; but there often exiſts a variety in theſe parts, in different ſubjects. The ſac is ſometimes ſituated lower down than in the former deſcription; is not always of the ſame dimenſions; is not compoſed of the ſame number of ducts; and frequently appears to conſiſt of ſeveral ſmall cells or ducts, inſtead of being one ſimple cavity. Beſides theſe deviations from the original ſtructure many other differences have been obſerved in diſſections.

SECT. V. *Of the* ABSORBENT VESSELS *of the* TRUNK.

The LYMPHATICS of the lower extremities having reached the trunk of the body, and paſſed under Poupart's ligament, appear upon the ſides of the oſſa pubis near the pelvis. A part of them paſſes up along with the iliac artery upon the brim of the pelvis; and another dips down into the cavity of the pelvis, and joins the internal iliac artery near the ſciatic notch. At this place they are joined by the lymphatics from the contents of the pelvis, particularly from the bladder, and veſiculæ *ſeminales* in the male, and from the uterus in the female; and there are likewiſe ſeveral branches which paſs through the ſciatic notch from the neighbourhood of the glutæi muſcles.

The lymphatic veſſels of the UTERUS, like its blood veſſels, are much enlarged, and therefore eaſily diſtinguiſhed, in the pregnant ſtate of that organ. They are in two ſets; one runs along with the hypogaſtric arteries and veins; the other with the ſpermatic veſſels. The lymphatics of the external parts of generation in the female go partly to the inguinal glands of each ſide, and partly through the rings of the external oblique muſcles to terminate in the glands of the loins or pelvis. At this part, where ſo many lymphatic veſſels join, there are commonly one or two glands.

Beſides thoſe lymphatic veſſels, which dip down into the cavity of the pelvis, on the inſide of the external iliac artery, there are others which keep on the outſide of that artery, upon the pſoas muſcle. Of theſe, one part paſſes up to the loins, and goes under the aorta in different branches, getting from the left ſide to the right, and joining the thoracic duct; and another paſſes under the iliac arteries, and appears upon the os ſacrum, making a beautiful network, joining the lymphatics of the right ſide, and paſſing under the ilia artery, to form a net-work upon the right pſoas muſcle. In different parts of this courſe, from Poupart's ligament to the loins, and alſo in the loins themſelves, there are, in moſt ſubjects, many lymphatic glands.

The lymphatic veſſels of the right ſide, joined by ſome from the left, having now reached the light lumbar region, appear there in the form of a plexus of large veſſels, and paſs through ſeveral glands. At this part, likewiſe, they receive large branches, under the aorta, from the plexus on the left ſide of the loins; and having at laſt got up, as high as the ſecond, or third, lumbar vertebra, they all join, and form a ſingle trunk, called the THORACIC DUCT. See PLATE VIII. *Fig.* 4. At this part they are likewiſe joined by the lacteals, which ſhall be next deſcribed.

The LACTEAL VESSELS, ſo called from their commonly conveying a fluid of the colour of milk, are found in two ſets, which communicate with each other; the internal begin from the inner ſurface of the inteſtines, where each lacteal is at firſt formed, upon the ſurface of the villi, by numerous ſmall radiated branches, with orifices deſtined to imbibe the nutritious fluid or chyle. From the cavity of the inteſtines, theſe veſſels paſs obliquely through their coats, uniting as they go, ſo as to form larger branches. They follow the courſe of the arteries and the veins, and are double their number; one being ſituated on each ſide.

Theſe branches run on the outſide of the gut to that part which is next the meſentery: and, whilſt they are yet upon the gut, they are ſometimes of a ſize ſufficient to admit a ſmall pipe, ſo that they have been frequently injected with mercury, in the human ſubject. And in man, as well as in different animals, the external ſet appear between the peritonæal and muſcular coat, and commonly run for a conſiderable way in the ſame direction with the inteſtine. From the inteſtines, they run along the meſentery and meſocolon, towards the ſpine; paſſing through the lacteals, in their way to the conglobate or meſenteric glands. Theſe glands divide the lacteals into two regions: from the inteſtines to the glands, theſe veſſels are called *lactea primi generis;* and from the glands to the thoracic duct, *lactea ſecundi generis.*

The lacteals of the JEJUNUM are larger and more numerous than thoſe of the ILIUM. Thoſe of the ſmall inteſtines, as they run upon the meſentery, commonly accompany the ſuperior meſenteric artery, and unite, as they proceed, into larger branches; ſo that, by the time they arrive at the root of the meſentery, they are of a conſiderable ſize. From the meſenteric artery, they deſcend by the ſides of the aorta, and open at laſt, into the thoracic duct: the lymphatics of the large inteſtines run ſomewhat differently. Thoſe from the cœcum, and from the right part, and great arch of the colon, join the trunks of the lacteals of the ſmall inteſtines about the root of the meſentery, whilſt thoſe from the reſt of the colon, terminate in the lumbar glands, or lower part of the thoracic duct, accompany the inferior meſenteric artery, and communicate with the large lymphatic veſſels near its root.

The lymph of the other abdominal viſcera likewiſe enters into the thoracic duct. This is brought by a number of veſſels, which, in all the viſcera, run in a ſuperficial, and in a deep ſet. A plexus of them may be traced from each KIDNEY, lying principally behind the emulgent artery, and opening into large lymphatic veſſels near the aorta. The lymphatics of the kidney are ſeldom ſeen in the ſound ſtate of that viſcus; but when it is enlarged or ulcerated, they are ſometimes diſtinctly obſerved: they run from its outer towards its inner edge, and immediately afterwards they paſs through the glands of the loins. The lymphatics of the glandulæ renales, or renal capſulæ, likewiſe terminate in the renal plexus.

The lymphatic veſſels of the SPLEEN paſs from the concave ſide of the viſcus, along with the ſplenetic artery in the ſinuoſity of the pancreas, by lymphatic veſſels of which they are joined. The deep ſeated lymphatics of the ſpleen are very conſiderable, and can be readily ſeen at its concave edge, but thoſe on its ſurface are ſmall and few in number; in quadrupeds, however, as in the bullock, they are remarkably numerous and large.

The STOMACH has two ſets of lymphatic veſſels, the one running upon its leſſer, and the other upon its greater curvature. Of theſe, the former accompanies the coronary artery, and paſſes through ſome lymphatic glands that lie by its ſides. The other ſet paſſes from the great curvature of the ſtomach, partly to the left, and partly to the right ſide. Thoſe on the left ſide receive the lymphatics of the left half of the great omentum, and run with the lymphatics of the ſpleen and pancreas to the thoracic duct. Thoſe on the right ſide receive the lymphatics from the right half of the great omentum, and paſs through ſome lymphatic glands that lie cloſe to the arteria gaſtrica dextra. Deſcending by the pylorus, they meet the plexus that accompanied the coronary artery; and near the leſſer curvature of the duodenum, form a conſiderable net-work.

Into this, not only the lymphatics from the ſpleen enter, but likewiſe thoſe from the gall-bladder, together with the deep ſeated lymphatics of the liver. Several branches proceed from this net-work; ſome running under the duodenum, and others over it; which all open into the thoracic duct, near the termination of the large trunk of the lacteals. The Thoracic duct is therefore the common trunk which receives the abſorbent veſſels of the lower extremities, the lacteals, and the lymphatics of the abdominal viſcera.

The lymphatics of the LIVER, like thoſe of the viſcera, are in two ſets; one of which lies upon the ſurface of the organ, and the other accompanies the large blood veſſels in its centre. Here theſe two ſets are found to communicate with each other very freely; ſo that, by injecting mercury into the lymphatic veſſels which lie upon its convex ſurface, we may fill thoſe which accompany the pori biliarii and vena portarum in its centre. Moſt of the lymphatic veſſels which lie upon the convex ſurface of the liver, run towards its falciform ligament, and paſs through the diaphragm into the glands which are ſituated on the anterior part of the pericardium. But others of them run towards the lateral ligaments of the liver, where they paſs alſo thro' the diaphragm, and afterwards run on its upper ſurface, to join thoſe from the ligamentum latum. This is the common courſe of the abſorbents on the convex ſide of the liver; but there is great variety.

A large trunk, from the glands above mentioned, runs up behind the ſternum, between the laminæ of the anterior mediaſtinum, and commonly joins the thoracic duct near its termination. Sometimes, however, inſtead of finding one trunk behind the ſternum, we meet with two or more on each ſide of the thorax, accompanying the internal mam mary veſſels; thoſe of the left ſide ending in the thoracic duct; thoſe of the right going into the lymphatic trunk on that ſide of the neck.

The lymphatics on the concave ſurface run towards the portæ, where they join thoſe which come from the centre of the liver, along with its blood veſſels. After they get from the liver, they are found to be very numerous. They paſs into glands on the vena portarum; and afterwards end in the thoracic duct, near the root of the ſuperior meſenteric artery. It is remarkable, that the valves of thoſe lymphatic veſſels which run upon the ſurface of the liver, can readily be made to give way, ſo that they may be injected from their trunks to their branches with great minuteneſs.

It has been ſuggeſted by Dr. Meckel, that the lymphatics of the ſtomach do not open into the thoracic duct like thoſe of the other viſcera, but into the ſanguiferous veins of the ſtomach. From repeated diſſections of the human ſubject, Mr. Hewſon has, however, been convinced of the contrary, and likewiſe from analogy with other animals, particularly fiſh, whoſe lymphatic veſſels either have no valves, or the valves readily give way; ſo that he has repeatedly puſhed injections from the thoracic duct into the lymphatics of their ſtomachs, as he has alſo done into the lymphatics of the other viſcera contained in the cavity of their abdomen.

The THORACIC DUCT, which receives all the veſſels that we have yet deſcribed, differs in its ſize in different ſubjects; but it is always ſmaller in its middle than at its beginning. Sometimes, its lower part is ſtill larger, and that enlargement has been called *receptaculum chyli.* It is conſiderable in ſome quadrupeds, in turtle, and in fiſh; but many anatomiſts have denied that there is any part of the thoracic duct, in the human ſubject, that deſerves the name of *receptaculum*, having never ſeen any thing like a pyriform bag, as it has been deſcribed, but merely an enlargement, not unlike a varix, and that only in few ſubjects; it generally appears only a little larger at its middle than at its ends. This lower extremity of the thoracic duct, is formed by the union of two or three very large trunks of lymphatic veſſels. The firſt and ſecond are formed by the lymphatics of the inferior extremities, and other parts already deſcribed; the third belongs chiefly to the lacteals.

Theſe large veſſels unite, ſo as to form the duct over the third vertebra lumborum, reckoning from above downwards. Upon the ſecond vertebra of the loins, the union of theſe veſſels is ſometimes twice or thrice as large in diameter as the duct is higher up; at other times, little or no enlargement can be obſerved. Theſe large lymphatic trunks, which form the thoracic duct, are ſpread out upon the ſpine, thoſe of the right ſide lying below the right crus diaphragmatis, and of the left paſſing between the aorta and the ſpine; whilſt the thoracic duct itſelf lies at firſt behind the aorta; but afterwards paſſes from that upwards, and a little to the right ſide, till it gets before the firſt vertebra of the loins. Here it is ſituated behind the right crus of the diaphragm, where it enlarges again, and ſometimes forms a pyriform bag, which has been conſidered by authors, as the beginning of the duct. From this part it paſſes upwards, being at firſt covered by the crus diaphragmatis, and afterwards appears in the thorax, upon the ſpine between the aorta and the vena azygos. In the thorax, it receives ſome lymphatics from the intercoſtal ſpaces, and afterwards veſſels from the lungs.

The ſuperficial lymphatics of the LUNGS form a beautiful net-work, the larger branches running chiefly between the lobules, the ſmaller paſſing over them; and here, as well as on the liver, and other parts there are numerous valves, the exiſtence of which has been denied by ſome authors.—From the ſurface they paſs to the root of the lungs, and there they go through the bronchial glands. At this place they are joined by the deep-ſeated abſorbents, which creep along the branches of the trachea, and likewiſe on thoſe of the pulmonary artery and vein.

Having left the glands, the principal part of thoſe from the left lung form a trunk which terminates in the thoracic duct, behind the diviſion of the trachea into its right and left branches. The reſt of the abſorbents of the left lobe paſs through glands behind the arch of the aorta, and which are likewiſe common to thoſe of the heart. *They run at laſt into the thoracic duct near its termination in the red veins.* After leaving the bronchial glands, the abſorbents of the right lung form three or four principal trunks; one of which commonly aſcends on the fore part of the vena cava ſuperior, and opens into the lymphatic trunk, that terminates in the veins of the right ſide of the neck. The reſt of theſe trunks go into the thoracic duct at the root of the lungs; and near this place the abſorbents of the right and left lungs communicate pretty freely together.

There are many glands called BRONCHIAL, at the root of the lungs, where the large blood-veſſels enter. They generally are of a blackiſh colour in the human ſubject, and have been ſuſpected to ſecrete the mucus which is ſpit up from the trachea; but later anatomiſts having frequently diſtinctly filled them with mercury, by injecting the lymphatic veſſels of the lungs, think it evident that they are not mucous but lymphatic glands.

The ABSORBENTS of the HEART, which have been known only by the lateſt anatomiſts, come from its ſuperficial and deep parts. Theſe afterwards form principal trunks which accompany the coronary arteries and veins, and like them, the largeſt belong to the left ventricle. From the ſide of the right coronary artery, an abſorbent paſſes over the arch of the aorta, to a gland commonly found behind the origin of the carotid arteries. The lymphatic, accompanying the left coronary artery, is formed of two principal branches; one of which runs up in the groove between the ventricles, and on the ſuperior ſurface of the heart; the other runs in a correſponding groove on the under ſide of the heart; and having reached the ſpace between the auricles and ventricles, turns round to join the former branch near the origin of its correſponding artery. Frequently, there are a conſiderable number on its ſides, and upon the lumbar vertebræ.

There are alſo lymphatic glands over the trunks of the blood-veſſels of the ſpleen, liver, kidneys, and renal capſules, which belong to the lymphatic veſſels of theſe organs. In the thorax, a few glands are found on the fore part of the pericardium, and upper ſurface of the diaphragm, belonging to the liver or diaphragm. Others are ſituated between the laminæ of the anterior portion of the mediaſtinum. Lymphatic glands are ſometimes obſerved by the ſides of the thoracic duct, particularly about the middle of the thorax, which belong principally to the veſſels of the lungs.

There are likewiſe many BRONCHIAL lymphatic glands, near the root of the lungs: theſe glands are placed upon the lymphatic veſſels, where they quit the lungs. But no lymphatic glands have yet been obſerved in the ſubſtance of the lungs; and the tubercles, which ſome ſuſpect to be obſtructed by lymphatic glands, ſeem to have a different origin. There are likewiſe ſome glands ſeen on the lymphatic veſſels, which lie near the ſubclavian veins at the upper part of the thorax, and which belong to the lungs.

Beſides theſe, there are ſome lymphatic glands, upon the aorta near the œſophagus; and there are alſo others occaſionally met with in the intercoſtal ſpaces. There are generally two or three contiguous to the thoracic duct, at the lower part of the neck and upper part of the thorax, near the termination of the duct, in the angle between the left jugular and the left ſubclavian vein; and a few are found over the internal mammary veſſels where the abſorbents of the liver paſs up within the thorax.

PART VII. NEUROLOGY.

SECT. I. *Of the* BRAIN *in* GENERAL *and its* INTEGUMENTS.

We cannot, with any propriety, enter upon NEUROLOGY, or the *deſcription of the* NERVES, without firſt deſcribing THEIR FOUNTAIN, that principal ſeat of the rational ſoul, commonly called the BRAIN. This name is given to all that maſs which fills the cavity of the cranium, and which is immediately ſurrounded by two membranes, called *meninges*, by the Greeks; but *matres* by the Arabians, who were of opinion, that theſe membranes were the origin, and, as it were, the *mothers* of all the other membranes of the body. The name given them by the Arabians is ſtill retained.

This general maſs is divided into three particular portions; the *cerebrum*, or *brain* properly ſo called, the *cerebellum* and *medulla oblongata*. To theſe three parts contained within the cranium, a fourth is added, which fills the great canal of the ſpina dorſi, and is known by the name of *medulla ſpinalis*, being a continuation of medulla oblongata.

The INTEGUMENTS of the brain are the two membranes above-mentioned; called *dura mater* and *pia mater*. The firſt is very ſtrong, and lies contiguous to the cranium; the other is very thin, and immediately touches the brain. The *pia mater* is again divided into two; the external lamina being termed *arachnoides*, the internal retaining the common name of *pia mater*.

The DURA MATER is a very compact ſtrong membrane, lining the inſide of the ſkull, firmly adhering at its baſis, though but ſlightly at the upper part, except at the ſutures. It has three proceſſes; the firſt named FALX (or the *falciform proceſs*, from its reſemblance to a ſcythe,) begins at the *criſta galli*, and runs backwards under the ſutura ſagittalis to the cerebellum, dividing the cerebrum into two hemiſpheres. Its uſe is ſaid to be, that of ſupporting one ſide of the cerebrum from preſſing on the other, when the head is inclined to one ſide. But it rather appears calculated to divide the brain into ſuch portions, as are leaſt liable to be diſturbed by any violent motions of the head; the under ſide of the brain being at the ſame time kept ſteady by the inequalities of the baſis of the ſkull, which the brain is exactly fitted to. In brutes the falx is always very ſmall; therefore in thoſe that have the brain of a larger ſize, as oxen, ſheep, horſe, &c. the upper part of the ſkull is made uneven, exactly to fit the folds of the brain, which ſecures the upper parts from concuſſion, in the ſame manner that the lower parts are ſecured. The 2d proceſs runs from the lower and back part of the former to the upper edge of each os petroſum, and ſuſtains the poſterior lobes of the cerebrum. that they might not compreſs the cerebellum. In ſome animals this proceſs is compoſed of bone. The third is a very ſmall proceſs, which runs from that laſt deſcribed, down towards the great foramen of the ſkull, and poſſeſſes that ſmall ſpace in the cerebellum, between the proceſſus vermiformis. Theſe proceſſes of the dura mater alſo ſerve to keep the brain ſteady.

The dura mater has in it ſeveral SINUSES, which anſwer the end of large veins to receive the blood from the leſſer veins of the brain. Their number is uncertain, and thoſe that are conſtant are not deſcribed in the ſame order by writers. The firſt that preſents itſelf is the LONGITUDINALIS SUPERIOR, running from a blind hole a little above the criſta galli, all along the upper edge of the falx. A tranſverſe ſection of this veſſel is not circular, like other veſſels, but a triangle, whoſe ſides are arches of a circle; the upper ſide convex outwards, and the two lower convex inwards. The figure of this veſſel is preſerved by ſmall ligaments running acroſs in the inſide, that it might not become conical, or cylindrical, like other veſſels, from the equal preſſure of the contained blood, and thereby incommode the upper edges of each hemiſphere of the cerebrum.

On the lower edge of this proceſs is generally another very ſmall one, called LONGITUDINALIS INFERIOR. This runs into the rectus, and when wanting, is ſupplied by a vein. The RECTUS runs between the two firſt proceſſes of the dura mater, and along with the ſinus longitudinalis ſuperior pours into the two lateral ſinuſes; but for the moſt part the longitudinal ſinus goes more directly into one of the lateral ſinuſes, and the ſtraight ſinus into the other. There is ſometimes a ſmall one in the third proceſs, which empties in the ſame place with the former.

From the terminations of the longitudinal and ſtraight ſinuſes, begin the two lateral ſinuſes, which, when they come to the os petroſum, dip down and paſs through the 8th foramina into the internal jugular vein. Another named *circularis*, runs round the fore part only of the cella turcica. The two extremities of this empty into four ſinuſes, one on the top of each os petroſum, which paſs into the ſinus lateralis, and one at the inferior parts of the ſame bones, which paſs indifferently into both the lateral and cervical ſinuſes. Theſe two laſt ſinuſes have always communicating branches.

The CERVICAL SINUSES run from the baſis of the ſkull through the great foramen on both ſides of the medulla ſpinalis colli, and through the tranſverſe proceſſes of the cervical vertebræ; the laſt of theſe have ſometimes proper foramina running from the 8th foramina to the back part of the apophyſis of the occipital bone. There are alſo two more of theſe veſſels, which run from the circular ſinus, between the os ſphenoides and the fore part of the os petroſum, directly into the internal jugular veins.

The PIA MATER is an exceedingly fine membrane immediately inveſting the brain, even between its lobes, hemiſpheres, and folds. It ſerves to contain the brain, and ſupports its blood veſſels, which run here in great numbers, and are divided into an infinite degree of minuteneſs, in order that the blood may not enter the brain too impetuouſly. Between the dura and pia mater, there is a membrane called TUNICA ARACHNOIDES, which is eaſily ſeen at the back part of the cerebrum, upon the cerebellum and back part of the medulla ſpinalis.

SECT. II. *Of the* CEREBRUM, CEREBELLUM, MEDULLA OBLONGATA, *and* MEDULLA SPINALIS.

I. The CEREBRUM is that part of the brain which occupies all the upper and fore part of the cranium; being ſeparated from the cerebellum by the ſecond proceſs of the dura mater. Its upper ſide is divided into two hemiſpheres, and its lower ſide into four lobes, two anterior and two poſterior, which latter are much the largeſt. At the meeting of the four lobes appears the *infundibulum*, which ſeems to be a lymphatic, running from the ventricles of the brain into the *glandula pituitaria:* This gland is ſeated in the cella turcica. Immediately behind the infundibulum, appear two ſmall bodies, named *protuberantiæ duæ albæ pone infundibulum*. Between the two hemiſpheres of the cerebrum, lower than the circumvolutions, appears a white body named CORPUS CALLOSUM. Under the corpus calloſum appear the two lateral or ſuperior ventricles, which are divided into right and left by a very thin membrane, named *ſeptum lucidum*, which is extended between the corpus calloſum and fornix.

The FORNIX is a medullary body beginning from the fore part of theſe ventricles, with two ſmall roots which ſoon unite; then running towards the back part, they divide into parts, called *crura fornicis*. In the baſis of theſe two ventricles are four prominences: The two anterior are called, from their inner texture, *corpora ſtriata;* the other two, *thalami nervorum opticorum*. Beyond theſe are other two proceſſes, called *nates;* and under them, nearer the cerebellum, two called *teſtes*.

Above the nates is ſituated the GLANDULA PINEALIS, famous for being ſuppoſed, by Des Cartes, the ſeat of the ſoul. Upon the thalami nervorum opticorum are a number of blood veſſels, glands, and lymphatics, called *plexus choroides*. Under the beginning of the fornix is a ſmall hole, called *foramen ad radices fornicis*, or *iter ad infundibulum;* and under the middle of the fornix, one called *foramen poſterius*, which is covered with a valve, named *membrana*, or *valvula major;* and the ſpace under the two anterior ventricles, between the foramina and the cerebellum, is the third ventricle.

II. The CEREBELLUM is ſituated under the ſecond proceſs of the dura mater. By dividing this part of the brain lengthways we diſcover more plainly the fourth ventricle, whoſe extremity is called *calamus ſcriptorius*. Here alſo appear two medullary bodies, called *pedunculi*, which are the baſis of the cerebellum. The medullary part in the cerebellum, though it is inmoſt, as in the cerebrum, yet is a different ſhape, being branched out like a plant.

The SUBSTANCE *of the* BRAIN is diſtinguiſhed into outer and inner; the former called *corticalis*, *cinerea*, or *glanduloſa;* the latter *medullaris*, *alba* or *nervea*.

III. The MEDULLA OBLONGATA is a medullary continuation of the under part of the cerebrum and cerebellum. It firſt appears in two bodies from the anterior part of the poſterior lobes of the cerebrum, called *crura medullæ oblongatæ*. The union of theſe crura between the cerebrum and cerebellum is called *iſthmus;* and immediately beyond this is an eminence named *proceſſus annularis*.

IV. The MEDULLA SPINALIS, or SPINAL MARROW, is a production of the medulla oblongata through the great foramen of the ſkull, and through the channel of the ſpine. It enlarges about the laſt vertebræ of the back and firſt of the neck, where the large nerves are given off to the arms. It again enlarges in the loins, where the crural nerves begin; and the lower end of it, joined with thoſe and other nerves, is called, from its reſemblance to the tail of a horſe, CAUDA EQUINA. The coats of this part are the ſame with thoſe of the brain; but the membrane here, which is analogous to the dura mater, is thinner and more connected to the bones, and the tunica arachnoides more conſpicuous.

SECT. III. *Of the* NERVES.

From the medulla oblongata and medulla ſpinalis a vaſt number of ſmall medullary white fibres are ſent out, which, at their firſt egreſs, ſeem eaſily to ſeparate; but as they paſs forward are ſomewhat more, but ſtill looſely connected, by the coat which they obtain from the pia mater, and at laſt piercing the dura mater, are cloſely embraced by that membrane, which covers them in their progreſs. Hence they become white, firm, ſtrong cords, and are well known to anatomiſts by the name of NERVES. To theſe coats an infinite number of ſmall veſſels, both arteries and veins, are diſtributed.

Although the NERVES, if all joined together, would hardly make a cord of an inch diameter, yet, from their exiſting in almoſt every part, they would appear to be diſtributed with the utmoſt degree of minuteneſs. In their courſe to the places for which they are deſtined they generally run as ſtraight as the part over which they are to paſs, and their own ſecurity from external injuries, will allow, ſending off their branches at very acute angles, and conſequently running more parallel than the blood veſſels. Their diſtribution is ſeldom different in the oppoſite ſides of the ſame ſubject, nor indeed in any two ſubjects is there any conſiderable variety to be found. Frequently nerves which come out diſtinct or ſeparate, afterwards conjoin into one faſciculus, under the ſame common covering; and though the nervous fibrils probably do not communicate, yet becauſe the coats at the conjoined part are common, and theſe ſtrong coats may have great effects on the ſoft pulpy nerves, it is evident all ſuch will have a conſiderable ſympathy with one another.

In ſome parts where theſe conjunctions take place, the ſize of the nerves ſeems much increaſed, and thoſe knotty oval bodies, named GANGLIONS, are formed. The coats of theſe knots are ſtronger, thicker, and more muſcular than the whole nerves which enter into them would ſeem to conſtitute; while the nervous fibrils paſs through without any great change.

The nerves are diſtinguiſhed into two claſſes, viz. thoſe of the ENCEPHALON, or *medulla oblongata*, and thoſe proceeding from the *medulla ſpinalis*. Of the firſt there are generally ten pair reckoned, of the laſt thirty. We ſhall deſcribe the nerves in the order in which they are generally ranked, though it is not poſſible to proſecute the diſſection of them after the ſame manner; but to ſupply this deficiency, we ſhall afterwards mention the order wherein they may be all demonſtrated on one ſubject.

I. Of the ten pair proceeding from the encephalon, the firſt are the OLFACTORY NERVES, which long had the name of *proceſſus mammillares*, and are ſmall, long, and without any cavity. Riſing from that part of the brain where the carotid arteries are about to enter, and running under the anterior lobes of the brain, they become a little larger, till they reach the os cribriforme, into the foramina of which the ſmall filaments inſinuate themſelves, and are immediately ſpread on the membranæ narium.

II. The ſecond pair are the OPTIC nerves, which ariſe ſingle from the thalami nervorum opticorum, and then uniting at the fore part of the cella turcica, ſeem to be pretty much blended. They afterwards divide, and running obliquely forwards, paſs out at their proper orifice in the ſphenoide bone, and enter the globe of the eye to be expanded into the membrana retinæ. The blood veſſels running thro' the middle of theſe nerves, and the ramifications of the retina are very obſervable, whence we may account for ſuch objects, as fall on the entry of the optic nerve, being loſt to us.

III. The third pair of nerves firſt appear at the interior part of the proceſſus annularis, and going out at the foramen lacerum, are diſtributed to the globe of the eye, muſculus rectus Fallopii, attollens, adducens, deprimens, and obliquus minor; therefore this pair have juſtly got the name of *motores oculorum*.

IV. The fourth pair, which are the ſmalleſt of any, derive their origin from the anterior lateral part of the proceſſus annularis, and go out at the foramina lacera, to be entirely ſpent on the muſculi trochleares, or obliqui majores oculorum, to which muſcles chiefly the rotatory motion of the eyes in ogling, and their advance forwards in ſtaring, is to be attributed. For theſe reaſons anatomiſts have called theſe nerves PATHETICI.

V. The fifth pair ariſe from the ſides of the annular proceſs, and after piercing the dura mater divide into three branches.

1. The firſt of theſe is the OPHTHALMIC, which, as it is about to enter the orbit by the foramen lacerum, ſends off a ſmall cord that aſſiſts in the formation of the intercoſtal, and then the nerve is diſtributed to the glandula lacrymalis, fat, membranes, and palpebræ of the eye, while it ſends one conſiderable branch through the orbiter internus anterior hole, to be diſtributed through the membrana narium, and a ſecond paſſes the foramen and ſupercilia to ſupply the muſcles and teguments of the forehead. Hence we may account for the muſcles of reſpiration being ſo much affected on the application of any ſubſtance to the membrana narium, which provokes that violent convulſive motion, called ſneezing.

2. The ſecond branch of the fifth pair, which may be called *maxillaris ſuperior*, paſſes out through the foramen rotundum oſſis ſphenoidis, and immediately gives nerves to the fat under the crotaphite muſcle, and to the palate, ſinus ſphenoidalis, and noſtrils. The remaining trunk inſinuating itſelf into the channel on the top of the antrum Highmorianum, to which cavity, and to the teeth of the upper jaw, it gives ſmall twigs, at laſt comes out at the orbiter externus hole, and is ſpent on the muſculus orbicularis palpebrarum, noſe, and upper lip, where ſome branches of the ſeventh pair ſeem to unite themſelves to different portions of this.

The third branch, or *maxillaris inferior*, goes out at the foramen ovale, and ſoon dividing into a great many branches, is diſtributed to the muſculus crotaphites, maſſeter, pterygoides, digaſtricus, buccinator, mylohyoideus, geniohyoideus, genio-gloſſus and baſio-gloſſus, glandula ſublingualis, maxillaris inferior, and parotis; and laſtly to the external ear, where it ſeems to join the portio dura to the ſubſtance of the tongue, in which it is pretty much confounded with the ninth pair. From the root of this laſt branch the *chorda tympani* is reflected. The laſt ramification of this branch which we ſhall mention, is that which enters into the canal of the upper jaw, furniſhes the teeth there, and comes out at the chin, on which and the lower lip it is beſtowed; at this place it is again conjoined to the ſeventh pair.

VI. The ſixth pair of nerves, ariſing from the fore part of the corpora pyramidalia, after piercing through the dura mater, give off a branch, which, joined with the reflected portion of the opthalmic branch of the fifth pair, forms the original of the *intercoſtal*, paſſes through the foramen lacerum to be ſpent entirely on the muſculus abductor oculi.

VII. The ſeventh pair iſſues out from the ſide of the root of the annular proceſs, and entering the meatus auditorius internus, and immediately dividing, one part ſoon loſes its firm coats, and is expended on the inmoſt camera of the ear, while the other, paſſing through the aquæductus Fallopii, comes out of the ſkull involved in all its coats between the ſtyloide and maſtoide proceſſes. Hence we ſee the reaſon of the firſt being named PORTIO MOLLIS, and the other PORTIO DURA.

This laſt, after its exit, ſupplies the muſculi obliqui capitis ſtylohyoidei, ſtylo-gloſſi, and ſtylo pharyngæi, and platyſma-myoides, on which, and to the ſkin of the neck, a great number of ſmall filaments run, which are ſometimes cut in opening the jugular vein, whence ariſe pain at firſt, and a little numbneſs afterwards. The ſuperior branches of it ſupply the parotid gland, external ear, and whole ſide of the face, as far forwards as the chin. It is ſaid to communicate thrice with the fifth pair, and twice with the ſecond vertebra.

VIII. The eighth pair of nerves derive their origin from the ſide of the baſis of the corpora olivaria, where their looſe filamentous texture is very conſpicuous; then running to the hole common to the oſſa temporum and occipitis, they are there joined by the ACCESSORIUS WILLISII, which has its beginning from the two or three ſuperior nerves of the medulla ſpinalis, and mounts upwards thither, to paſs out with the 8th pair, at that common foramen juſt now mentioned. Very ſoon after, the acceſſorius ſeparates from its companion, and after paſſing through the middle of the muſculus maſtoideus, is loſt in the muſculus trapezius and rhomboides ſcapulæ.

1. The large trunk, which, from the great number of

branches it ſends off, obtains the name of VAGUS, or PAR VAGUM, runs ſtraight down the neck, near the carotid artery, in its courſe giving ſeveral branches to the larynx. After entering the thorax, it ſplits into two portions, the anterior of which ſerves the pericardium, ſends branches to join with thoſe of the intercoſtal that go to the heart, and then on the right ſide turns down the ſubclavian, and on the left, round the ductus anterioſus, to mount again upwards at the ſide of the œſophagus and be loſt in the larynx. This RECURRENT branch we are cautioned to avoid in bronchotomy.

2. The poſterior branch of the eighth pair goes along with the œſophagus, and ſupplies the lungs, the gula, and ſtomach, very plentifully; and as all the nerves beſtowed on this viſcus enter at its ſuperior orifice, the ſenſation here muſt be very acute, whence Van Helmont imagined the orifice of the ſtomach to be the ſeat of the ſoul! What remains of this par vagum is adjoined to the intercoſtal, immediately below the diaphragm.

IX. The 9th pair appear firſt at the inferior part of the corpora pyramidalia, paſs out at their proper holes of the occipitis, and after ſending off ſome nerves to the glandula thyroidea, and muſculi ſterno-hyoidei, and ſterno-thyroidei, are loſt in the ſubſtance of the tongue. Authors have diſputed whether this ninth, or the fifth is the guſtatory nerve.

X. The 10th pair proceeds from the beginning of the medulla ſpinalis, betwixt the os occipitis and firſt vertebra colli, and is all, except what goes to the ganglion of the intercoſtal, ſpent on the muſculi obliqui, and extenſores capitis.

The only nerves proceeding from the encephalon, not deſcribed, are the reflected branches of the 5th and 6th, which indeed are ſo ſmall and pappy, and hid by the carotid artery, as they go out with it, in its crooked canal, as not to be eaſily traced; but when they have left the os petroſum, they are joined by branches from the 8th, 9th, and 10th pairs, and the 1ſt and 2d ſpiral; and the largeſt ganglion of the body is formed, from which the nerve, now named INTERCOSTAL, goes out and deſcends down the neck with the carotid, ſupplying in its courſe the flexor muſcles of the head and neck, and communicating with the cervical nerves. As the intercoſtal nerve is about to enter the thorax, it again forms a ganglion, from which the nerves to the trachea and the heart are ſupplied, which join with the branches of the 8th, and paſs between the two large arteries and auricles to the ſubſtance of that muſcle.

The INTERCOSTAL NERVE after this runs down on the ſide of the vertebra of the cheſt, having additional nerves conſtantly ſent to it from between theſe vertebra, till it paſſes through its own proper opening through the diaphragm; whence it again forms another ganglion, cloſe by the gandulæ renales, into which the 8th pair enter. From a ſimilar knot on each ſide, the nerves of the inteſtines, liver, ſpleen, pancreas, and kidneys, are derived; nay the extremity of this nerve is ſent down into the pelvis to ſupply the parts contained in it. Hence their ſtrong ſympathy with each other may be eaſily imagined, and a reaſon may be given for the violent vomiting that commonly attends the nephritic paroxyſms, and for the colic and ſtomach achs, which often precede obſtructions of the menſes in women.

Before we proceed to the SPINAL NERVES, we ſhall point out the order in which the nerves already deſcribed are to be diſſected, in order to demonſtrate them all in one ſubject; but to them we muſt annex the three firſt cervical nerves, for a reaſon which will hereafter be evident.—Portio dura ſeptimi, frontalis quinti, facialis quinti, mentalis quinti, ſpinalis ſecundus, ſpinalis primus, olfactorius, ophthalmicus quinti, motorius oculi, patheticus ſextus, opticus, maxillaris inferior quinti, maxillaris ſuperior quinti, acceſſorius Williſii, nonus, decimus, octavus, intercoſtalis portio mollis ſeptimi.

The thirty pair of nerves proceeding from the medulla ſpinalis are generally divided into four ſpecies; viz. of the neck 7; of the back 12; of the loins 5; and of the os ſacrum 6. As the medulla ſpinalis has none of thoſe inequalities ſo obſervable on the medulla oblongata, the riſe of the nerves is not ſo accurately deſcribed, being only determined by the bones through which they paſs.

The FIRST CERVICAL nerve goes out between the firſt and ſecond vertebra, and, after ſending off the branches that communicate with the tenth and ſecond vertebra, is ſpent on the muſculus flexus colli, ſplenius, complexus, and tegiments of the occiput.

The SECOND CERVICAL communicates with the 9th, and with the firſt and third of the neck, and then is diſtributed to the teguments of the neck and ſide of the head, and to the glandula parotis and external ear, where it joins with the portio dura.

The THIRD CERVICAL paſſes out between the 3d and 4th vertebra, ſoon communicating with the ſecond, and ſending down a large branch, which being joined by another from the 4th, forms the phrenic nerve, that runs along the pericardium, and is loſt in the diaphragm. In this courſe the right phrenic makes a ſmall turn round that part of the pericardium, which covers the *apex of the heart*. The other branches of this third cervical are diſtributed to the muſculus trapezius and deltoides, and to the teguments on the top of the ſhoulder; which, with the deſcription of the 8th pair, leads us evidently to the cauſe of Hippocrates's obſervation, that an inflammation of the liver is generally attended with a hiccough; and a ſuppuration of that viſcus, with a violent pain on the top of the ſhoulder.

The FOURTH CERVICAL NERVE, after ſending off that branch which joins with the 3d to form the phrenic, runs ſtraight to the axilla, where it meets with the 5th, 6th, and 7th cervicals, and firſt dorſal. All theſe ſink in the interſtices of the muſculi ſcaleni; and all of them are ſo often conjoined and blended, after they have given off nerves to the muſcles of the neck, ſcapula, arm, and thorax, and to the teguments, that when the ſeveral ramifications go off in the axilla to the different parts of the ſuperior extremity, it is impoſſible to determine which of them the branches belong to. The conſiderable branches into which they are divided, are 6; and to theſe proper diſtinguiſhing names have been given, by which the young anatomiſt's memory will be aſſiſted.

I. The CUTANEUS runs down the fore part of the arm, and ſerves the teguments, as far as the palm of the hand and fingers.

II. The **musculo cutaneus**, or *perforans casserii*, paſſes through the muſculius coracobrachialis, and after ſupplying the biceps and brachiæus internus, is ſpent on the teguments of the back of the cubitus and hand.

III. The **muscularis**, which runs down the fore-part of the arm to be loſt in the muſculi flexores carpi, digitorum, &c.

IV. The **ulnaris**, which ſupplies the extenſores cubiti, and teguments of the elbow, and then paſſing through the ſinuoſity at the back of the external condyle of the humerus, runs along the ulna, where it gives portions to the teguments and neighbouring muſcles. At length it is loſt in the back of the hand, muſculi interoſſei, and lumbricales in the little finger, and ſide of the ring finger next to this. The courſe of this nerve is ſufficiently felt, when we lean on our elbow, by the inſenſibility or prickling pain that occur in the parts to which it is diſtributed.

V. The **radialis** goes down the fore part of the arm, near the radius, beſtowing branches in its progreſs on the circumjacent muſcles; then dividing at the ligamentum annulare carpi it is ſent to the thumb, fore finger, middle finger, and half the ring finger, and to the back of the hand.

VI. The **articularis** runs almoſt round the top of the os humeri, and ſerves the muſculi extenſores, cubiti retractores, and elevatores humeri.

The 12 dorſal nerves all communicate with one another. as ſoon as they make their way out between the vertebræ, each of them gives a poſterior branch to the muſculi erectores trunci corporis. The firſt, after having ſent off the brachial nerve, already deſcribed, is, after the ſame manner with the ſucceeding 8, beſtowed on the pleura and intercoſtal muſcles. The 10th and 11th are moſt of them ſent to the abdominal muſcles. The 12th communicates with the firſt lumbar, and is beſtowed on the muſculus quadratus lumbalis and iliacus internus. See Plate VIII. fig. 5.

The 5th lumbar alſo communicates, and gives poſterior branches. The firſt ſends ſeveral branches to the abdominal muſcles, pſoas, and iliacus, while others go from it to the teguments and muſcles on the ſuperior and anterior part of the thigh; and the main trunk of it is loſt in the crural. The 2d paſſes through the pſoas muſcle, and is diſtributed much as the former. The 3d is loſt in the muſculus pectineus.

Branches proceeding from the 1ſt, 2d, and 3d, make up one trunk, which runs along the anterior part of the pelvis, and ſlipping through a ſmall ſinuoſity in the anterior part of the foramen magnum iſchii, is ſpent in the muſculus triceps. This nerve is commonly known by the name of *obturator*, or *poſterior crural* nerve.

By the union of branches from the 1ſt, 2d, 3d, and 4th lumbar nerves, the anterior crural nerve is formed, which running along the pſoas muſcle, eſcapes with the large blood-veſſel out of the abdomen below the tendinous arcade of its muſcles, and is diſtributed to the muſcles and teguments on the fore part of the thigh. One branch of this crural nerve accompanies the vena ſaphena as far as the ancle.

The remainder of the 4th and 5th lumbar nerves join with the 1ſt, 2d, and 3d that proceed from the os ſacrum. Theſe 5, when united, conſtitute the largeſt nerve of the body, ſo well known by the name of *ſciatic*, or *iſchiatic nerve*, which ſeems to be bigger, in proportion to the part for the uſe of which it is deſigned, than the nerves of any other part are. The intention of this may be to afford ſufficient ſtrength to the muſcles of the lower extremity, for exerting a force ſuperior to what is required of any other part of the body. When the functions of this nerve are in any way impeded, we know how difficult it is to ſupport ourſelves to walk. The ſciatic nerve goes out at the large hollow behind the great tubercle of the os iſchium, and paſſing over the quadrigemini muſcles, runs down the poſterior part of the thigh, giving off every where as it goes, nerves to the teguments and muſcles of the thigh and leg.

At the ham, the ſciatic nerve divides into 2; the ſmaller part mounts over the fibula, and ſerving the muſculi peronei, flexores pedis, and extenſores digitorum, is continued to the toes along the broad of the foot, while the larger trunk ſinks under the muſculi gemelli, and then divides. One part of this diviſion is ſpent in the muſcles at the back of the leg and teguments, while the other is continued by the inner ancle to the foot. Theſe then ſubdivide; one branch of each ſubdiviſion is diſtributed after the ſame manner as the ulnaris, and the other as ths radialis in the hand. The other nerves, that come out of the os ſacrum, are ſent to the organs of generation, muſculi levatores ani, and obturatores.

Sect. IV. *Of the* Vis Nervea.

Anatomiſts univerſally agree, that to the nerves we owe all *ſenſation* and *motion*, of which they are the proper organs; and the ſenſations in the minuteſt parts being very diſtinct, the inſtruments of ſuch ſenſations muſt have diſtinct origins directed to each part. Though all are agreed as to the effect, yet anatomiſts have hitherto vainly endeavoured to inveſtigate the cauſe, and ſhew how it is produced. Some have contended, that ſenſation and motion are occaſioned by a *vibration* communicated to the nerves, which they ſuppoſed entirely ſolid and tenſe in their ſtructure; whilſt others accounted for it, by ſuppoſing the exiſtence of a ſubtle fluid which was moved in them, and to which they gave the name of *animal ſpirits*.

A later, and much more probable hypotheſis, than either of theſe, has ariſen from the diſcovery of a ſpecies of electricity peculiar to animal bodies, and concerning which very intereſting accounts have been lately given by Galvini and others. Theſe, though ſufficiently deciſive to render nugatory all that has before been advanced on this difficult and almoſt inſcrutable topic, are yet far from affording a ſatisfactory ſolution of the phenomena of nervous influence. It may not be amiſs, however, to relate what are the prevailing opinions concerning the influence of the nerves in producing muſcular motion.

The exiſtence of a **vis insita** in the muſcles, different from *vis nervea*, having been advanced by Dr. **Haller**, in his *Elementa Phyſiologiæ*, (ſee Part II. Sect. 1.) this doctrine has been called in queſtion by ſeveral, particularly by Dr. **Monro**, who urges the following ſtrong objections to it, in his Obſervations on the Nervous Syſtem:

“ The chief experiment,” ſays the Dr. “ which ſeems to have led Dr. Haller to this opinion, is the well-known one, that the heart and other muſcles, after being detached from the brain, continue to act ſpontaneouſly, or by ſtimuli may be raiſed into action for a conſiderable length of time; and when it cannot be alledged, ſays Dr. Haller, that the nervous fluid is by the mind, or otherwiſe impelled into the muſcle.

"That in this inſtance, we cannot comprehend by what power the nervous fluid or energy can be put in motion, muſt perhaps be granted; but has Dr. Haller given a better explanation of the manner, in which his vis inſita becomes active?—If it be as difficult to point out the cauſe of the action of the *vis inſita*, as that of the action of the *vis nervea*, the admiſſion of that new power, inſtead of relieving, would add to our perplexity. We ſhould then have admitted, that two cauſes of a different nature were capable of producing exactly the ſame effect; which is not in general agreeable to the laws of nature.

"We ſhould find other conſequences ariſe from ſuch an hypotheſis, which tend to weaken the credibility of it. For inſtance, if in a ſound animal the vis nervea alone produces the contraction of the muſcles, we will aſk what purpoſe the vis inſita ſerves? If both operate, are we to ſuppoſe that the vis nervea, impelled by the mind or living principle, gives the order, which the vis inſita executes, and that the nerves are the internuncii; and ſo admit two wiſe agents employed in every the moſt ſimple action? But inſtead of ſpeculating farther, let us learn the effect of experiments, and endeavour from theſe to draw plain concluſions.

"I. When I poured a ſolution of opium in water under the ſkin of the leg of a frog, the muſcles, to the ſurface of which it was applied, were very ſoon deprived of the power of contraction. In like manner when I poured this ſolution into the cavity of the heart, by opening the vena cava, the heart was almoſt inſtantly deprived of its power of motion, whether the experiment was performed on it fixed in its place, or cut out of the body.

"II. I opened the thorax of a living frog; and then tied or cut its aorta, ſo as to put a ſtop to the circulation of its blood. I then opened the vena cava, and poured the ſolution of opium into the heart; and found, not only that this organ was inſtantly deprived of its powers of action, but that in a few minutes the moſt diſtant muſcles of the limbs were extremely weakened. Yet this weakneſs was not owing to the want of circulation, for the frog could jump about for more than an hour after the heart was cut out. In the firſt of theſe two experiments, we obſerve the ſuppoſed vis inſita deſtroyed by the opium; in the latter, the vis nervea; for it is evident that the limbs were affected by the ſympathy of the brain, and of the nervous ſyſtem in general, with the nerves of the heart.

"III. When the nerves of any muſcle is firſt divided by a tranſverſe ſection, and then burnt with a hot iron, or punctured with a needle, the muſcle in which it terminates contracts violently, exactly in the ſame manner as when the irritation is applied to the fibres of the muſcle. But when the hot iron or needle is confined to the nerve, Dr. Haller himſelf muſt have admitted, that the vis nervea, and not the vis inſita, was excited. But here I would aſk two queſtions.

"Firſt, Whether we do not as well underſtand, how the vis nervea is excited when irritation is applied to the muſcle, as when it is applied to the trunk of the nerve, the impelling power of the mind ſeeming to be equally wanting in both caſes?

"Secondly, If it appears that irritation applied to the trunk of a nerve excites the vis nervea, why ſhould we doubt that it can equally well excite it, when applied to the ſmall and very ſenſible branches and terminations of the nerve in the muſcle?

"As, therefore, it appears that the ſuppoſed vis inſita is deſtroyed or excited by the ſame means as the vis nervea; nay that when, by the application of opium to the heart of a frog, after the aorta is cut and the circulation interrupted, we have deſtroyed the vis inſita, the vis nervea is ſo much extinguiſhed, that the animal cannot act with the diſtant muſcles of the limb; and that theſe afterwards grow very torpid, or loſe much of their ſuppoſed vis inſita: it ſeems clearly to follow, that there is no juſt ground for ſuppoſing that any other principle produces the contraction of a muſcle?"

The VIS NERVOSA, or operation of the mind, if we may ſo call it, by which a muſcle is brought into contraction, is not inherent in the muſcle like the *vis inſita*, neither is it perpetual, like this latter property. After long continued or violent exerciſe, for example, the voluntary muſcles become painful, and at length incapable of further action; whereas the heart and other involuntary muſcles, the motions of which depend ſolely on the *vis inſita*, continue through life in a conſtant ſtate of action, without any inconvenience or waſte of this inherent principle.

In a word, the action of the vis nervoſa on the voluntary muſcles conſtitutes what is called muſcular motion; a ſubject that has given riſe to a variety of hypotheſes, many of them ingenious, but none of them ſatisfactory.

EXPLANATION OF PLATE VIII.

FIG. 1. A VIEW *of the* HEART *and* BLOOD VESSELS.

1. The right ventricle of the heart of a fœtus injected with wax. 2. The right auricle. 3. The left auricle. 4. Branches of the pulmonary veins of the right lobe of the lungs, thoſe of the left being cut off ſhort. 5. The arteries of the left lobe of the lungs. 6. The vena cava deſcendens. 7. Aorta aſcendens. 8. Arteria pulmonalis. 9. Ductus arterioſus.

FIG. 2. ANOTHER VIEW *of the* BLOOD VESSELS.

10. The unbilical vein. 11. Branches of the vena portarum in the liver. 12. Ductus venoſus. 13. Branches of the cava in the liver. 14. Vena cava.

FIG. 3. *The* INSIDE *of the* ARM *diſſected, to ſhow the* COURSE *of the* VEINS, ARTERY, *&c.*

1. Part of the biceps flexor cubiti. 2. The faſcia tendinoſa from that muſcle, which is liable to be pricked in opening the baſilic vein. 3. The humeral artery, on each ſide of which is a large vein. 4. Vena cephalica. 5. Vena meniana. 6. Vena baſilica.

FIG. 4.

FIG. 4. *The* TRUNK, *with a view of the* LYMPHATIC VESSELS *and the* DUCTUS THORACIUS.

1. The neck. 2, 2. The two jugular veins. 3. The vena cava ſuperior. 4, 4, 4, 4. The ſubclavian veins. 5. The beginning of the aorta, pulled to the left ſide by a ligature, to ſhow the thoracic duct behind it. 7. The branches ariſing from the curvature of the aorta. 7, 7. The two carotid arteries. 8, 8. The firſt ribs. 9, 9. The trachea. 10, 10. The ſpine. 11, 11. The vena azygos. 12, 12. The deſcending aorta. 13. The cœliac artery, dividing into three branches. 14. The ſuperior meſenteric artery. 15. The right crus diaphragmatis. 16, 16. The two kidneys. 17. The right emulgent artery. 18, 18. The external iliac arteries. 26, 29. The muſculi pſoæ. 19. The internal iliac artery. 20. The cavity of the pelvis. 21, 21. The ſpine of the os ilium. 22, 22. The groins. 23. A lymphatic gland in the groin, into which lymphatic veſſels from the lower extremity are ſeen to enter. 24, 24. The lymphatic veſſels of the lower extremities paſſing under Poupart's ligament. 25, 25. A plexus of the lymphatic veſſels on each ſide of the pelvis. 26. The pſoas muſcle with lymphatic veſſels upon its inſide. 27. A plexus of lymphatics, which having paſſed over the brim of the pelvis at 25, having entered the cavity of the pelvis, and received the lymphatic veſſels belonging to the viſcera contained in that cavity, next aſcends, and paſſes behind the iliac artery to 29. 28. Some lymphatic veſſels of the left ſide paſſing over the upper part of the os ſacrum, to meet thoſe of the right ſide. 29. The right pſoas, with a large plexus of lymphatics on its inſide. 30, 30. The plexus on each ſide of the ſpine. 31. Spaces occupied by the lymphatic glands. 32. The trunk of the lacteals, on the under ſide of the ſuperior meſenteric artery. 33. The ſame dividing into two branches, one of which paſſes on each ſide of the aorta; that of the right ſide being ſeen to enter the thoracic duct at (34.) 34. The thoracic duct beginning from the large lymphatics. 35. The duct paſſing under the lower part of the crus diaphragmatis, and under the right emulgent artery. 36. The thoracic duct penetrating the thorax. 37. Some lymphatic veſſels joining that duct in the thorax. 38. The thoracic duct paſſing under the curvature of the aorta to get to the left ſubclavain vein; the aorta being drawn aſide to ſhow the duct. 39. A plexus of lymphatic veſſels paſſing upon the trachea from the thyroide gland to the thoracic duct.

FIG. 5. NERVES.

1. The deſcending intercoſtal nerve. 2. Nerves of the neck. 3. The brachial nerves. 4. A ganglion in the deſcending intercoſtal nerve to the viſcera. 5. Branches from the intercoſtal nerves to the viſcera. 6. A probe under ſome of the intercoſtal nerves, that paſs out between the ribs. 7. The anterior crural nerves.

FIG. 6. *A* REPRESENTATION *of the* UTERUS *and its* APPENDAGES.

1. The ſide of the uterus next the gut. 2. The fallopian tubes. 3. The fimbriæ. 4. Ovaria. 5. The mouth of the uterus. 6. Ligamenta rotunda. 7. The inſide of the vagina. 8. The orifice of the meatus urinarius. 9. The glands clitoridis. 10. The external labia of the vagina. 11. The nymphæ, which are continued from the præputium clitoridis.

PART VIII. OF THE SENSES AND THEIR ORGANS.

SECT. I. *Of the* SENSES *in* GENERAL.

Although the SENSES, properly ſpeaking, are like the SOUL, *immaterial*, implying certain ſenſations excited in the mind by external objects, and in this reſpect not proper ſubjects of anatomy, yet, as not only their whole *objects*, but likewiſe all their ORGANS are material, and ſubject to the knife of the anatomiſt, they conſtitute a very proper, and indeed a moſt important branch of anatomical knowlege.

The number and names of the ſenſes are univerſally known. The latter are moſt commonly and we believe moſt juſtly expreſſed in the participle: *Feeling*, (improperly ſtiled by ſome anatomiſts, *the Touch*,) *Taſting*, *Smelling*, *Hearing*, and *Seeing*. Theſe five ſenſes comprehend our whole ſources of ſenſation and knowledge. Without them, the mind could have no ideas. Without even the two laſt, we ſhould be more ignorant than the brutes. But deprived of the whole, (if it were poſſible to ſuppoſe an organized body ſuch as we have deſcribed, ſo totally defective) we would be mere maſſes of un-ininformed matter, as inert and inſenſitive as plants or minerals.

Among the innumerable proofs, which the anatomiſt may draw from the preſent ſtate of our exiſtence, of an all-wiſe ſuperintending providence, who over-rules even the defects of our nature, we cannot help here remarking, that although many individuals want *one* of theſe avenues to knowledge, none that we have ever heard or read of, have been ſo unfortunate as to be born deficient of thoſe *two* moſt important ſenſes, *ſeeing* and *hearing*. Though it is eaſy to ſuppoſe ſuch a caſe poſſible, yet we believe an inſtance of it has not occurred ſince the creation. And indeed, if it were to happen, it is difficult to conceive how it would be poſſible, to convey a ſingle ſcientific idea to the mind of ſuch an unfortunate human being. Perſons deprived of the one of theſe ſenſes often make aſtoniſhing acquiſitions of knowledge by means of the other; but a human being, deprived of both from his birth, would have little more ſenſation than an oyſter.

SECT. II. *Of* FEELING.

The ſenſe of FEELING has, by ſome anatomiſts, not only been improperly ſtiled the TOUCH, which is only a *partial exertion* of the ſenſe of feeling, but, upon what principle we know not, has been abſolutely reſtricted to the papillæ of the cutis: although nothing is more certain, than that this ſenſe is almoſt univerſally diffuſed throughout the whole body, both externally and internally. Some parts, indeed, have leſs ſenſibility than others, in proportion as they are ſupplied with many or few nerves. The lungs and the glands on this account have only an obſcure degree of feeling: And other parts, ſuch as the bones, cartilages, epidermis, &c. we will admit, have none. From the experiments made by Baron Haller, it even appears, that the ligaments, tendons, dura and pia mater, pericardium and perioſteum, which were formerly ſuppoſed to be highly ſenſible, are void of ſenſibility in a ſtate of health. But all this is owing to their having no nerves. And even theſe in certain ſtages of diſeaſe, when by ſwellings, or otherwiſe, they affect the adjacent nerves, become highly ſenſible. In ſhort, the ramifications of the nerves are ſo univerſally diffuſed through the whole body, that the ſenſe of feeling, with a very few exceptions, extends more or leſs to every part of it, and might, therefore, be ſtiled, in compariſon of the other four, the UNIVERSAL SENSE. Indeed, if it were otherwiſe, amputations and other painful operations in ſurgery might be performed with very little trouble to the patient.

Upon this general view of the ſenſe of feeling, as diffuſed through the whole ſyſtem, for obvious and uſeful purpoſes, it appears, like the other ſenſes, indeed, to be in general *paſſive*; as we cannot help feeling the impreſſion of an object that *touches* any part of our body, whether hard, ſoft, ſolid, fluid, ſharp, blunt, hot or cold, &c. But although it is in general a paſſive ſenſe, it is capable by an effort of the will, of making thoſe *active* exertions, which properly come under the denomination of TOUCH. This active power ſeems chiefly lodged in the hands, or rather in the fingers, which may be thus accounted for.

The papillæ of the fingers, or inſide of the hand, may, by the operations of the mind, become erect or elevated, and being then gently preſſed or rubbed againſt a tangible body, they receive an impreſſion, which is conveyed to the brain, and is what we call the TOUCH. By this exertion we perceive the different qualities of bodies. Humidity, ſoftneſs, hardneſs, figure, &c. are the reſult of examination by the touch, which likewiſe ſerves to correct the miſtakes of our other ſenſes, though it ſometimes errs itſelf. The rete mucoſum moderates the action of the object touched, and preſerves the ſoftneſs of the papillæ. The cuticle excludes the air from withering and deſtroying the ſkin; and qualifies the impreſſions of bodies, ſo that they may be only ſufficient to affect the touch, without cauſing pain.

The exterior properties of bodies, ſuch as their ſolidity, moiſture, inequality, ſmoothneſs, dryneſs, or fluidity, and likewiſe their degree of heat or cold, are all capable of making different impreſſions on the papillæ, and conſequently of exciting different ideas in the ſenſorium. But this organ, like all the other ſenſes, is not equally delicate in every ſubject; being in ſome much more exquiſite than in others. In perſons born blind, it is ſometimes ſo exquiſite, as in a conſiderable degree to ſupply the place of ſight. We have read of a French lady of the preſent age, born blind, who had acquired a degree of touch ſo incredibly delicate, as to be able to read a printed book merely by feeling the forms of the letters, from the impreſſion made by the types! Though we will not vouch for this fact, yet it is certain, that blind perſons often make wonderful acquiſitions, merely by the habitual uſe of the ſenſe of feeling, and repeated exertions of the touch.

SECT. III. *Of* TASTING.

The ſenſe of TASTING, falls naturally to be conſidered after that of FEELING, as it is not only in ſome reſpects a *ſpecies* of it, but its principal organ, like thoſe of the other, is furniſhed with papillæ. The tongue, every body knows, is the chief organ of the TASTE; and, from certain experiments, it appears that this ſenſe is exerciſed by the tongue chiefly, although it is not confined to that member alone. For, on whatever part of the mouth, palate, or gums, we apply a ſapid body, we do not perceive the ſenſe of pain, but of taſte; and from ſome bodies, as alum, pepper, &c. the ſenſation produced will be ſtronger and more diſtinct in theſe parts, than any where elſe. That ſenſation which is ſometimes excited in the ſtomach, œſophagus, and fauces, by the regurgitation of the elements, ſeems alſo to belong to the tongue, to which the ſapid vapours are ſent back, uncommonly acrid and penetrating; and even that which is ſometimes occaſioned in the ſtomach, œſophagus, and fauces, from a riſing of the aliments, ſeems alſo to be owing to the tongue, to which the taſteable vapours are conveyed.

The PAPILLÆ of the tongue, which are larger and ſofter than thoſe of the ſkin, and perpetually moiſt, perform the office of touch more exquiſitely than the ſmall and dry cutaneous papillæ. The papillæ of the tongue being raiſed a little protuberant to perform the office of taſte, are affected in a particular manner by ſalts diſſolved in water, or ſaliva, and applied againſt their tips or ſummits; which being diſtinguiſhed by the mind, and referred to certain claſſes, are called *taſtes*, either ſour, ſweet, acerb, bitter, ſaline, urinous, ſpirituous, aromatic, or pungent and acrid, inſipid, putrid, and others reſulting partly from pure ſalts, and in part from an intermixture of the ſubtile animal, or vegetable oils, variouſly compounding and changing each other.

It has been a queſtion whether the diverſity of the taſtes ariſes from the different figures which are natural to ſalts? And whether the cubical figure of ſea ſalt is the reaſon of its having a different taſte from the nitre that is priſmatical, or from other ſalts of a different form? We anſwer, that this does not ſeem probable; for, even taſteleſs cryſtals have their particular configurations; and the taſte ariſing from very different ſalts, and differently qualified objects of this ſenſe, are too much like each other, and at the ſame time too inconſtant and changeable, to allow ſuch a theory; for example in nitre. The mechanical reaſon, therefore, of the diverſity of taſtes, ſeems to reſide in the intrinſic fabric of the elements of ſapid bodies, which do not fall under the ſcrutiny of our ſenſes.

The nature or diſpoſition of the covering with which the papillæ are clothed, together with that of the juices, and of the aliments lodged in the ſtomach, have a conſiderable ſhare in determining the ſenſe of taſte; inſomuch, that the ſame flavour does not equally pleaſe or affect the organ in all ages alike, nor in perſons of all temperaments; nor even in the ſame perſon at different times, and in different ſtates of health or diſeaſe. In general, whatever contains leſs ſalt than the ſaliva itſelf, ſeems inſipid.

It has been aſſerted, that the ſpirituous parts, more eſpecially of vegetables, either penetrate into the papillæ themſelves, or elſe are abſorbed by the adjacent villi of the tongue. And the ſpeedy reſtitution of the ſtrength by vinous or aromatic liquors, has been urged as a proof of this, as, it is argued, this reſtitution takes place even before they are received into the ſtomach. But this argument is not concluſive, as theſe phænomena can be much more ſatisfactorily accounted for, upon the principle of excitement, or by the operation of the vis nervea.

One obvious intention of this ſenſe, and of the great variety of taſtes ſuited to it, afforded by different kinds of aliment, doubtleſs is, that we may know and diſtinguiſh ſuch foods as are moſt ſalutary; for, in general, there is not any one kind of wholeſome aliment, that is of a diſagreeable taſte; nor are there any ill-taſted ſubſtances that are fit for our nouriſhment. By exceſs, indeed, the moſt wholeſome food becomes prejudicial. We are invited to take neceſſary food, as well by the pain called hunger, as by the pleaſure ariſing from the ſenſe of taſte.

The tongue is likewiſe one of the principal inſtruments of ſpeech, and of the articulation of the voice. It ſerves alſo to collect all the morſels which we chew; to turn them in different manners and to different parts of the mouth; and to rub off whatever ſticks to the palate; and it is uſeful in ſpitting, ſucking, &c. It bears a great part in deglutition, being aſſiſted by the digaſtric muſcles; which, by contracting, at the ſame time, that the other muſcles preſs the lower jaw againſt the upper, raiſe the os hyoides, and fix it at a convenient height; that the ſtylo-gloſſi and hyo-gloſſi may make the baſis of the tongue bear back upon the morſel which is to be ſwallowed, and force it into the pharynx, the portions of which, that are at that time immediately above the morſel, inſtantly contract, and puſh it into the œſophagus.

SECT. IV. *Of* SMELLING.

The ſenſe of SMELLING has alſo been ranked by ſome fanciful theoriſts, who would allow us to have only *three* ſenſes, as a ſpecies of *feeling*. But all the *five* are ſufficiently diſtinct in their objects, as well as in their organs, to juſtify the uſual arrangement. As the taſting noxious food might in many inſtances be highly dangerous, we are enabled by ſmelling alone, to diſcover the noxious quality of aliments, eſpecially ſuch as are putrid, and conſequently peculiarly hurtful to the human frame; and at the ſame time that it directs us to avoid what is dangerous, it enables us to diſcern what is grateful and wholeſome. This uſe of ſmelling, in chooſing food, is more obſervable in brutes than in men; yet men in a ſtate of nature, and who are undebauched by a variety of ſcents, poſſeſs this ſagacious faculty in a very eminent degree. The powers and virtues of medicinal plants are hardly to be better known, than by the ſimple teſtimony of taſting and ſmelling. Hence it is, than in all animals theſe organs are placed together; and hence the ſmelling is ſtronger, and the organs larger, in thoſe animals which have to ſeek their prey at a conſiderable diſtance, or to reject malignant plants from among thoſe that are fit for food.

The act of ſmelling is performed by means of a ſoft pulpy membrane, full of pores and ſmall veſſels, which lines the whole internal cavity of the noſtrils; it is thicker upon the ſeptum and principal convolutions, but thinner in the ſinuſes. Within this membrane are diſtributed veſſels and nerves which have been already deſcribed.

The NERVES of the noſe, being almoſt naked, require a defence from the air, which is continually drawn through the noſtrils, and blown out again by reſpiration. This part, which is the organ of ſmelling, is therefore ſupplied with a thick inſipid mucus, very fluid in its firſt ſeparation, but by the air condenſing into a thick, dry, and more conſiſtent cruſt. By this mucus the nerves are defended from drying and from pain. It is poured out from many ſmall arteries, and depoſited partly into numerous and clyndrical ducts, and partly into round viſible criptæ or cells, ſcattered over all the noſtrils. It flows out all over the ſurface of the olfactory membrane, which is anointed with it on all ſides. This mucus is accumulated during night; but, in the day it either flows ſpontaneouſly, or may be more powerfully expelled by blowing the noſe. By becoming dry and harſh, it iritates the very ſenſible nerves of the membrane, when a ſneezing is excited for its removal.

The SINUSES of this part, which abound with mucus, are evacuated through apertures deſcribed, Part. I. Sect. III. The tears deſcend, by a channel proper to themſelves, into the cavity of the noſe, by which they moiſten and dilute the mucus. The cartilages render the noſe moveable by its proper muſcles, ſo as to be raiſed and dilated by a muſcle common to the upper lip, and to be contracted together into a narrow compaſs, by the proper depreſſor and compreſſor muſcle pulling down the ſeptum. Thus the prominent organ of ſmelling is adapted to the reception of ſcents; and it is dilated in proportion to the quantity of inhaled air, and again contracted, when the air is expelled in the ſame degree. The air, filled with the ſubtile and inviſible effluvia of bodies, conſiſting of their volatile, oily, and ſaline particles, is, by the powers of reſpiration, urged through the noſe, and applied to the almoſt naked, and conſtantly ſoft olfactory nerves, in which a kind of *feeling* is excited, which we call *ſmelling;* and by this ſenſe we diſtinguiſh ſeveral kinds of oils and ſalts, by different ſcents or odours, which are not eaſily reducible to claſſes, or recalled to memory. The odours, however, already eſtabliſhed, are ſufficient for our purpoſe.

This ſenſe ſerves to admoniſh us not only of pernicious putrefaction, but of violent acrimony; or of a mild and ſoapy quality in bodies. As ſalt, joined with an oil, is the object of taſte; and a volatile oil, added to ſalts, ſerves to excite ſmells, we may perceive the affinity of theſe two ſenſes; which affinity ſeems to be the more neceſſary, on account of theſe ſenſes mutually and jointly aſſiſting each other in performing their offices. Volatile particles are chiefly diſtinguiſhed by ſmell, and fixed ones by taſte; perhaps becauſe the thick mucous cuticle, ſpread over the tongue, intercepts the actions of the more ſubtle ſaline effluvia from acting upon the taſte, which eaſily affect the ſofter and leſs covered nerves of the internal noſe.

We know not the reaſon why ſome ſmells pleaſe, and others diſpleaſe; perhaps cuſtom may have ſome influence in this reſpect. The power of odours is ſtrong and quick, becauſe minute particles of matter are immediately applied to naked nerves ſituated very near the brain. Hence the force of poiſonous vapours, and hence alſo the quality certain odours poſſeſs, of recovering people from faintings, or after drowning. Hence alſo that violent ſneezing which often ariſes from acrid particles, and a diarrhœa from the ſmell of ſome medicines; hence the power of particular antipathies. Hence alſo the pernicious effects of exceſſive ſneezing, more eſpecially in producing blindneſs, which may, in ſome meaſure, alſo be more eaſily brought on by the conſent of the nerves, which are exceedingly numerous in the neighbouring organs. Among the various parts of the noſe, the ſeptum, and more eſpecially the os turbinatum, have a conſiderable ſhare in the organ of ſmelling, theſe parts being multiplied in quick-ſcented animals. In dogs and other quadrupeds, they are prodigiouſly lengthened, and beautifully formed into ſpiral laminæ: in fiſhes they are elegantly formed, like the teeth of a comb.

SECT. V. *Of* HEARING.

Previous to a deſcription of the manner, in which we are enabled to receive the impreſſions of ſound, it is proper to deſcribe the EAR, which is the ORGAN of HEARING. It is commonly diſtinguiſhed into *external* and *internal*. The former includes all that we are able to diſcover without diſſection, and the meatus auditorius, as far as the tympanum; and the latter, all the other parts of the ear.

The EXTERNAL EAR is compoſed of cartilage, (a ſubſtance beſt ſuited to preſerve its form, without being liable to break,) covered by the common integuments, and attached, by ligaments and muſcles, to the temporal bone. Although capable only of a very obſcure motion, it is found to have ſeveral muſcles. Different parts of it are diſtinguiſhed by different names; all its cartilaginous part is called *ala*, or *wing*, to diſtinguiſh it from the ſoft and pendent part below, called the *lobe*. Its outer circle or border is called *helix*, and the ſemicircle within this, *antihelix*. The moveable cartilage placed immediately before the meatus auditorius, which it may be made to cloſe exactly, is named *tragus;* and an eminence oppoſite to this at the extremity of the antihelix is called *antitragus*.

The CONCHA is a conſiderable cavity formed by the extremities of the helix and antihelix. The meatus auditorius, which at its opening is cartilaginous, is lined with a very thin membrane, which is a continuation of the cuticle from the ſurface of the ear. The uſe of the external ear is to collect ſounds, and direct them into the meatus auditorius, which is the paſſage that leads to the tympanum or drum. This paſſage is lined with a glandular membrane, in which alſo is ſome hair. The CERUMEN, or yellow WAX, which is ſecreted by theſe glands, is diffuſed over this membrane, and ſerves to defend it from the drying qualities of the air, and alſo to entangle any inſect that might otherwiſe get into the ear, and create much uneaſineſs. But indeed this ſeldom happens, as its bitterneſs generally prevents them. Sometimes this wax being ſeparated in too great quantity, fills up the paſſage and cauſes deafneſs; while, on the other hand, the ear is liable to great diſcharges of matter from the meatus auditorius. Theſe are commonly called impoſthumes, but are probably nothing elſe than an inflammation of the membrane we have deſcribed, and which cauſes an increaſed ſecretion from the glands.

At the farther extremity of the meatus auditorius lies the *membrana tympani*, which is extended upon a boney ridge almoſt circular. Its ſituation both in men and quadrupeds is nearly horizontal, inclined towards the meatus auditorius, which appears to be the beſt poſition for receiving ſounds; as they generally are reverberated from the earth. In men it is concave outwardly, but in birds it is convex, ſo as to place the upper ſide of it nearly perpendicular to the horizon, and render them more capable of hearing each other's ſounds when almoſt in the air, where there can be but little reverberated ſound. This membrane does not entirely cloſe the paſſage, but has on one ſide a ſmall aperture covered with a valve. It has been found half open in perſons who in their life-time had not been deaf; and inſtances have been known, of men who could force the ſmoke of tobacco through their ears, in which caſe it could only go from the mouth through the euſtachian tube, and through the tympanum; yet in theſe inſtances the hearing was perfect. Experiments on animals indeed have proved that we may break the tympanum in both ears, and yet not deſtroy the hearing, and only with the temporary inconvenience of ſtrong ſounds being for ſome time heard with a degree of pain and uneaſineſs. Indeed there is a caſe upon record, in which the tympanum of a man was deſtroyed by an ulcer, and the auditory bones caſt out, and that without deſtroying the patient's hearing.

From theſe, and the like caſes, it may be concluded, *that* the membrana tympani, though uſeful in hearing, *is not* the ſeat of that ſenſe; and if any diſeaſe in that membrane ſhould obſtruct the paſſage of ſounds to the internal parts of the ear, an artificial paſſage, through that membrane, might reſtore the ſenſe of hearing, as the removal of the opaque cryſtalline humour recovers ſight. Many years ago, a malefactor was pardoned on condition that he ſubmitted to this experiment; but he happened to fall ill of a fever which delayed the operation, and in the mean time there was ſo great a public clamour raiſed againſt it that the attempt was dropt.

This membrane in very young children is often covered with mucus; but whether this is to be conſidered as a morbid appearance, or as neceſſary to prevent ſounds from affecting them too much, is uncertain. The father of four children born deaf was adviſed to lay bliſters upon the heads of the next children he might have, which he did to three that were born afterwards, and every one of *them heard* well. It ſeems not unreaſonable to ſuppoſe, that too great a quantity of this mucus upon the drum might be the cauſe of deafneſs in the four children; and that the diſcharge made by the bliſters in the latter caſes, was the cauſe of their eſcaping the like evil.

Into the middle of the tympanum is extended a ſmall bone MALLEUS, from its reſemblance to a hammer; whoſe oppoſite end is articulated to a bone called INCUS, from its likeneſs to an anvil; which latter bone is alſo articulated by the intervention of an exceeding ſmall one called *orbiculare*, to a fourth bone called STAPES, or the *ſtirrup*, which it is very like. Theſe bones are contained in that cavity behind the tympanum, which is called the barrel of the *ear*; but ſome anatomiſts call the barrel only *tympanum*, and the membrane, *membrana* tympani. The malleus, being moved inward by the muſcles *obliquus internus*, or *trochlearis*, extends the tympanum that it may be more ſenſibly affected by the impulſe of ſounds, when they are too weak. This muſcle riſes from the cartilaginous part of the euſtachian tube, and paſſing from thence in a proper groove, it is reflected under a ſmall proceſs; and thence paſſes on, perpendicular to the tympanum, to be inſerted into the handle of the malleus, ſometimes with a double tendon.

Another extenſor of the tympanum, called OBLIQUUS EXTERNUS, lies parallel to this muſcle. It ariſes from the outer and upper part of the euſtachian tube, and paſſing through the ſame hole with the chorda tympani, which is a branch of the fifth pair of nerves, it is inſerted into a long proceſs of the malleus. This is not ſo obviouſly an extenſor as to be known to be ſo, without an experiment. The muſcle which relaxes this membrane is called externus tympani. It ariſes from the upper part of the auditory paſſage, and is inſerted into the upper proceſs of the malleus. The relaxation of the tympanum is made by this muſcle, without our knowledge, when ſounds are too ſtrong; and, as the pupil of the eye is contracted, when we have too much light, and dilated when there is too little, ſo, when ſounds are too low, or the ſenſe of hearing imperfect, the extenſors of the tympanum ſtretch it to make the impulſe of ſounds more effectual; juſt as in the caſe of a common drum, or the chords of any muſical inſtrument.

From the cavity behind the tympanum, which is called the barrel of the ear, goes the EUSTACHIAN TUBE, or *iter ad palatum*; it ends cartilaginous behind the palate. This paſſage ſeems to be exactly of the ſame uſe with the hole in the ſide of the common drum, that is, to let the air paſs in and out from the barrel of the ear to make the membrane vibrate the better; and perhaps, in the ear, which is cloſer than a common drum, to let air in or out as it alters in denſity; and if any fluid ſhould be ſeparated in the barrel of the ear, to give a paſſage to that alſo. This tube, when obſtructed, as ſometimes happens from the growth of a polypus between the uvula, occaſions great difficulty of hearing.—Sometimes, on the other hand, when the meatus auditorius is obſtructed, a man, by opening his mouth wide, will hear well through this paſſage; which is often ſo open, that, on ſyringing water through the noſe, it paſſes into the barrel of the ear, and cauſes a temporary deafneſs. To try how far one can hear this way, it is only neceſſary to ſtop the ears, and take between the teeth the end of a wire, or chord, that will vibrate well, and holding the other end, ſtrike it, and the ſound that he hears, will be received through this paſſage.

The STAPES has a muſcle, called *muſculus ſtapedis*; it lies in a long channel, and ending in the ſtapes, ſerves to pull the ſtapes off the *feneſtra ovalis*, which, otherwiſe, it covers. Beſides the feneſtra ovalis, there is near it another, ſomewhat ſmaller, called *rotunda*. Theſe two holes lead to a cavity, called *veſtibulum*, which opens into other cavities, aptly called *cochlea*, and three ſemicircular canals, altogether named the *labyrinth*; in which are ſpread the auditory nerves, to receive and convey the impulſe of ſounds to the brain. Beſides theſe, the *chorda tympani*, which is a branch of the fifth pair of nerves, may alſo convey theſe ſenſations to the brain.

The two holes, called FENESTRA OVALIS and ROTUNDA, are cloſed with a fine membrane, like that called the drum, and the larger, being occaſionally covered, and uncovered, by the ſtapes, cauſes ſound to be modulated, more or leſs, as beſt ſerves the purpoſes of hearing; and this advantage being added to that of a lax or tenſe tympanum, the effect of ſounds may be greatly increaſed or leſſened upon the auditory nerves, expanded in the labyrinth. In the loudeſt ſounds, the tympanum may be lax, and the feneſtra ovalis covered; and for the loweſt, the tympanum may be tenſe, and the feneſtra uncovered. If ſounds, propagated in the ear, were heard leſs, we might often be in danger before we were apprized of it; and if the organs of hearing were much more perfect, unleſs our underſtandings were ſo too, we ſhould commonly hear more things at once than we could attend to.

The SENSE of HEARING, in producing which all the parts we have deſcribed aſſiſt, is occaſioned by a certain modulation of the air, collected by the funnel-like ſhape of the external ear, and conveyed through the meatus auditorius, to the membrana tympani. That ſound is propagated by means of the air, is very eaſily proved, by ringing a bell, under the receiver of an air-pump; the ſound it affords, being found to diminiſh gradually, as the air becomes exhauſted, till at length it ceaſes to be heard at all. Sound moves through the air, with infinite volocity; but the degree of its motion ſeems to depend on the ſtate of the air, as it conſtantly moves faſter in a denſe and dry, than it does in a moiſt and rarefied air. See ACOUSTICS.

That the air, vibrating on the membrana tympani, communicates its vibration to the different parts of the labyrinth, and by means of the fluid contained in this cavity, affects the auditory nerve, ſo as to produce ſound, ſeems to be very probable; but the ſituation, the minuteneſs, and the variety of the parts which compoſe the ear, do not permit much to be advanced, with certainty, concerning their mode of action. Some of theſe parts ſeem to conſtitute the immediate organ of hearing, and theſe are all the parts of the veſtibulum: but there are others, which ſeem intended for the perfection of this ſenſe, without being abſolutely eſſential to it, as appears from the inſtances above mentioned.

Sound is more or leſs loud, in proportion to the ſtrength of the vibration; and the variety of ſounds ſeems to depend on the difference of this vibration; for, the more quick and frequent it is, the more acute will be the ſound, and *vice verſa*. Before we conclude this ſection, it will be proper to explain certain phenomena, which have a relation to the organ of hearing.

There are few people, who have not, in conſequence of particular ſounds, occaſionally felt that diſagreeable ſenſation, which is uſually called *ſetting the teeth on edge*. The cauſe of this ſenſation may be traced, to the communication which the portio dura of the auditory nerve has, with the branches of the 5th pair, that are diſtributed to the teeth, being probably occaſioned by the violent tremor, produced in the membrana tympani, by theſe very acute ſounds. Upon the ſame principle, we may explain the ſtrong idea of ſound, which a perſon has, who holds a vibrated ſtrong ſtring between his teeth.

The humming, which is ſometimes perceived in the ear, without any exterior cauſe, may be occaſioned, either by an increaſed action of the arteries in the ear, or by convulſive contractions of the muſcles of the malleus and ſtapes, affecting the auditory nerve in ſuch a manner as to produce the idea of ſounds. Mr. Elliot, in his Philoſophical Obſervations on Hearing, ſays, that there are ſounds liable to be excited in the ear, by irritation, and without any aſſiſtance from the vibrations of the air.

Sect. VI. Of Seeing.

The organs of the ſenſe of SEEING, are divided into two parts: viz. the INTERNAL, which is the globe or body of the eye; and the EXTERNAL, which comprehends all thoſe parts, ſurrounding the globe, and ſubſervient to it. The EYES are ſituated in two bony cavities, named ORBITS, where they are ſurrounded by ſeveral parts, which are either intended to protect them from external injury, or to aſſiſt in their motion. Theſe orbits have all their vacant ſpaces filled with a looſe fat, which ſerves as a proper ſocket for them to move or reſt in.

The globe of the eye is immediately covered by two PALPEBRÆ, or eye-lids, which are compoſed of muſcular fibres, covered by the common integuments, and lined by a very fine and ſmooth membrane, which is from thence extended over part of the globe of the eye, and is called *tunica conjunctiva*. Each eye-lid is cartilaginous at its edge; and this border, which is called *tarſus*, is furniſhed with a row of hairs, named CILIA, or *eye-laſhes*.

The CILIA ſerve to protect the eyes from inſects, and minute bodies floating in the air, and likewiſe to moderate the action of the rays of light, in their paſſage to the retina. At the roots of theſe hairs, there are ſebaceous follicles, firſt noticed by Meibomius, which diſcharge a glutinous liniment. Sometimes the fluid they ſecrete has too much viſcidity, and the eye-lids become glued to each other.

The upper border of the orbit is covered by the SUPERCILIA, or eye-brows, which, by means of their two muſcles, are capable of being brought towards each other, or of being carried upwards. They have been conſidered as ſerving to protect their eyes, but they are probably intended more for ornament than utility. It is obſervable, that the eye-brows are peculiar to the human ſpecies. The inner angle of each orbit, or that part of it which is near the noſe, is called CANTHUS MAJOR, or the *great angle;* and the outer angle, which is on the oppoſite ſide of the eye, is the CANTHUS MINOR, or *little angle*.

In the upper and outer part of the orbit is ſeated, the LACHRYMAL GLAND. Its uſe is to furniſh a watery ſecretion, called the tears, which anſwer the end of waſhing off duſt and keeping the outer ſurface of the eye moiſt, without which, the tranſparent *cornea* would be leſs pellucid, and the rays of light diſturbed in their paſſage to the retina; and that this liquor may be rightly diſpoſed of, we are continually cloſing the eye-lids, to ſpread it equally, even when we are not conſcious of doing ſo. At the inner corner of the eye, between the eye-lids, is a little reddiſh colour, called *caruncula lachrymalis*, which ſeems placed there, to keep that corner of the eye-lids from being ſo totally cloſed, as to hinder the diſcharge of tears or gummy matter from the eye-lids, during ſleep. Cloſe to this caruncle, are ſituated, the *puncta lachrymalia*, which are little holes, one in each eye-lid, deſigned to carry off the ſuperfluous tears into the *ductus ad naſum*.

The TUNICA CONJUNCTIVA is the firſt membrane of the eye. It covers ſo much of the eye, as is called the white, and being reflected all round, lines the two eye-lids. Being thus returned from the eye, to the inſide of the lids, it effectually hinders any extraneous bodies from getting behind the eye, into the orbit, ſmooths the parts it covers, and thus renders the friction leſs between the eye and the eye-lids. This coat is very full of blood veſſels, as appears when it happens to be attacked with inflammation.

The TUNICA SCLEROTICA, is every where white and opaque, and is joined, at its anterior edge, to another coat, which has more convexity, than any other part of the globe, and being exceedingly tranſparent, and ſomewhat like horn, is called CORNEA.—Some writers, who have given the name of *cornea* to all this outer coat, have named what is here and moſt commonly called *ſclerotica*, *cornea opaca;* and its anterior and tranſparent portion, *cornea lucida*. Thoſe two parts are perfectly different in their ſtructure; ſo that ſome anatomiſts ſuppoſe them to be as diſtinct from each other, as the glaſs of a watch is, from the caſe into which it is fixed. The ſclerotica is of a compact fibrous ſtructure; the cornea, on the other hand, is compoſed of a great number of laminæ, united by cellular membranes. The ancients ſuppoſed the ſclerotica to be a continuation of the dura mater. Morgagni, and ſome other modern writers, are of the ſame opinion; but this point is diſputed by Winſlow, *Haller*, Zinn, and others.

Under the cornea lies the IRIS, which is an opake membrane, like the tunica choroides, but of different colours in different eyes, ſuch as blue, grey, black or hazel from which it is named *Iris*, after the goddeſs of the rainbow. The middle of the iris is perforated for the admiſſion of the rays of light, and is called the *pupil*. Immediately under the iris lie the *proceſſus ciliares*. When the iris contracts, it dilates the pupil, and by that means ſuffers more rays of light to enter into the eye; whilſt the contrary is effected by the circular fibres of the iris acting from the circumference towards the centre. But theſe changes are not made with great quickneſs, as appears from the eyes retaining the painful effects of a ſtrong light, for ſome time after we come out of a dark place, and from our being unable at firſt to diſtinguiſh objects, on going ſuddenly from a light place to a dark one.

As the PUPIL always dilates in darker places, to receive more rays of light, ſo when any diſeaſe *prevents the effect* of thoſe rays, it dilates as in dark places to admit more light; this happens in the diſeaſe called *gutta ſerena*. In the human ſubject, the pupil is round, which enables us to ſee in every direction alike; it is alſo round in thoſe animals that are naturally the prey of other animals, both birds and beaſts. But quadrupeds of the graminiverous kind have it horizontally oblong, by which they are fitted to view a large ſpace over the earth; while animals of the cat kind, who climb trees and prey indiſcriminately on birds or animals that hide in the earth, have their pupils oblong the contrary way, by which they can look upwards and downwards at the ſame time.

The CHOROIDES lies immediately under the ſclerotis, and is a ſecond tunic, or membrane very vaſcular, and of little firmneſs. It takes its name, indeed, from being furniſhed with a great number of veſſels. It has likewiſe been named *uvea*, on account of its reſemblance to a *grape*. Many modern anatomical writers have conſidered it as a production of the pia mater. This was likewiſe the opinion of the ancients; but the ſtrength and thickneſs of the choroides, when compared with the delicate ſtructure of the pia mater, are ſufficient proofs of their being two diſtinct membranes.

Immediately below the tunica choroides, lies the third coat, called the **RETINA**, which is an expanſion of the optic nerve, co-extended with the choroides. Rays of light ſtriking upon this membrane, the ſenſation is conveyed by the optic nerves, to the common ſenſorium. Theſe nerves, do not enter at the middle of the bottom of the eyes, but nearer the noſe; for thoſe rays of light being ineffectual for viſion that fall upon the entrance of the optic nerves, it fit they ſhould ſo enter, as that the ſame object, or part of an object, ſhould not be unperceived in both eyes, which would have been the caſe, had they been otherwiſe inſerted; which appears from a common experiment of part of an object being loſt to one eye, when we are looking towards it with the other ſhut. In fiſh theſe nerves ariſe diſtinct from the oppoſite ſides of the brain, and croſs without uniting; but as theſe animals have their eyes ſo placed, as not to ſee the ſame object with both eyes at once, whilſt thoſe animals, whoſe optic nerves ſeem to unite, *do* ſee the ſame object with both eyes at once, one would ſuſpect, that in one they were joined to cauſe the object not to appear double, and that in the other they were kept diſtinct, to make the two eyes, which muſt view different objects at the ſame time, independent of each other.

Some, however, argue, that the ſeeing objects ſingle does not depend upon any ſuch union, nor even upon the circumſtance of the light ſtriking upon correſponding fibres of the nerves, but upon a *judgment* derived from *actual experience*; all objects appearing ſingle to both eyes in the manner we are the moſt uſed to obſerve them, but in other caſes double. For though we have a diſtinct image from each eye ſent to the brain, yet while both theſe images are of an object ſeen in one and the ſame place, we conceive of them as one; ſo when one image appears to the eyes of a ſquinting perſon, in two different places, it gives the idea of two; and when two bodies are ſeen in one place, as two candles rightly placed, through one hole in a board, they appear one.—This hypotheſis, however, is liable to inſurmountable objections, and appears to be contradicted by the experience of all mankind.

Between the tunica choroides and retina there is interpoſed a black powdery ſubſtance called *nigrum pigmentum*. With the origin of this, anatomiſts are as yet unacquainted, ſince no glandules can be diſcovered, which may be thought to yield it. The uſe chiefly aſſigned it, is that of abſorbing the rays of light as they paſs through the tranſparent net-work of the retina, ſo as to render viſion more acute. In animals that graze this pigment is of a ſhining green colour.

On the under ſide of the iris and within the eye, we obſerve thoſe minute fibres above mentioned, called *ciliary proceſſes*, which paſs in radii or parallel lines from the circumference to the centre. The contraction and dilatation of the pupil are ſuppoſed to depend on the action of theſe proceſſes. Some have conſidered them as muſcular, but they are not of an irritable nature; others have ſuppoſed them to be filaments of nerves; but their ſtructure has never yet been clearly aſcertained.

The inſide of the eye is filled with three humours, called *aqueous*, *cryſtalline*, and *vitreous*. The *aqueous humour* lies foremoſt, and ſeems chiefly of uſe to prevent the cryſtalline from being eaſily bruiſed by rubbing, or a blow; and perhaps it ſerves for the cryſtalline humour to move forward in, while we view near objects, and backward for more remote objects; without which mechaniſm, or, in the place of it, a greater convexity in the cryſtalline humour in the former caſe, and a leſs convexity in the latter, it is difficult to imagine, according to the laws of optics, how we could ſo diſtinctly ſee objects at different diſtances.

It has been inſiſted by ſome writers, that fiſh are able to draw their cryſtalline humour nearer to the bottom of the eye, when they are out of the water, and to throw it forwards when in the water; becauſe the rays of ſight are leſs refracted in paſſing from water through the cryſtalline humour than from air. On the motions of this part of the ſubject indeed, a new opinion has been advanced by Mr. Hunter, who, in the cryſtalline humour of the eye in many animals, but particularly in the cuttle fiſh, diſcovered a laminated and ſomething like a muſcular ſtructure. By this kind of mechaniſm it is ſuppoſed, that inſtead of approaching or receding to accommodate itſelf to different diſtances, the cryſtalline poſſeſſes a power of augmenting or diminiſhing its convexity. But this doctrine wants confirmation.

Behind the aqueous humour lies the **CRYSTALLINE**. Its ſhape is that of a depreſſed ſpheroid; and it is diſtinctly contained in a very fine membrane or capſule called *aranea*. This humour being ſomewhat ſolid and of a convex form, has the effect of refracting the rays of light which paſs through it; ſo that each pencil of rays from the ſame point of any object, may be united upon the retina, ſimilar to what happens in a camera obſcura. As tranſparent bodies refract the rays of light, not only in proportion to their convexity, but alſo in proportion to their different denſities, whenever the cryſtalline humour is removed in the operation for the cateract, the aqueous poſſeſſes it place and becomes a lens; but that refracting light leſs than the cryſtalline, the patient needs a *convex* glaſs before he can ſee accurately.

In ſome eyes, either this humour being too convex or too diſtant from the retina, the rays unite too ſoon, unleſs the object is held very near to the eye; and this fault is remediable only by a glaſs of an oppoſite ſort, viz. by a *concave* glaſs, as the contrary fault, common to old perſons, is by a *convex*. Had the eye been formed for a nearer view, the object to be viewed would often obſtruct the light; if, for a more diſtant view, light enough would not commonly be produced from the object to the eye. In fiſh the cryſtalline humour ſeems a perfect ſphere, which is neceſſary for them, becauſe light being leſs refracted from water through the cryſtalline humour than from air, that defect is compenſated by a more convex lens.

The **VITREOUS HUMOUR** is a gelatinous tranſparent body, which lies behind the cryſtalline, and fills up the greateſt part of the globe of the eye. Its fore ſide is rendered concave by the impreſſion of the cryſtalline, and its back ſide convex, in conſequence of the globular ſhape of the organ. It ſerves as a medium to keep the cryſtalline humour and the retina at a due diſtance, and to tranſmit the rays of light which are reflected from external objects.

The eye receives its arteries from the internal carotid, through the foramina optica, and its veins paſs through the foramina lacera, and empty themſelves into the external jugulars. Beſides the optic nerve which enters at its poſterior part, the eye receives from the 3d, 4th, 5th, and 6th pair of nerves.

The humours of the eye, together with the cornea, are calculated to refract and converge the rays of light in ſuch a manner as to form at the bottom of the eye a diſtinct image of the object we look at; and the point where theſe rays meet is called the *focus* of the eye. On the retina, as in a *camera obſcura*, the object is painted in an inverted poſition; and it is only by habit that we are enabled to judge of its true ſituation, and likewiſe of its diſtance and magnitude.

This is the generally received philoſophical doctrine upon the ſubject of optics; but it is a doctrine from which we cannot help expreſſing our diſſent, becauſe hypotheſis is here not only unſupported by fact, but placed in *direct oppoſition* to it. In this, as well as in the former ſuppoſition, that we would ſee objects *double*, did not experience, and judgment convince us, that they are ſingle, we ſuſpect too great a compliment is paid to *judgment* and *habit*. At what period of life, we would aſk the ſupporters of theſe doctrines, does a child begin to exerciſe this degree of *judgment*, that they alledge is neceſſary to correct the miſtakes of this ſenſe of ſeeing? And what is the reaſon, if the doctrine be true, that none of us can recollect the time, when we *really* ſaw people walking with their feet uppermoſt, and every thing elſe turned upſide down? As to our ſeeing objects double, becauſe we have two organs of viſion, and correcting the miſtake by habit, it may as well be affirmed, that we *hear* every *ſound* double becauſe we have *two ears!* Of this laſt hypotheſis, which no philoſopher has as yet ventured to broach, evidences might be brought from the well known fact of the reduplication of ſounds by echoes, fully more deciſive, than any we have yet met with, in proof of the doctrine of *double* or *inverted viſion*.

In ſhort, thoſe who ſupport this theory, ſeem to draw a falſe concluſion from a philoſophical fact; and, in our opinion, to argue as abſurdly, as an ignorant perſon would do, who knew nothing of printing, and who, upon being taken into a printing-office, and obſerving the types all ſet the backward way, ſhould from thence conclude, that books were really printed in an *inverted* form, but that learned men, by *habit* and *experience*, had acquired the art of reading them the right way. In all probability it is as neceſſary to our ſeeing objects as they really are, that the images of theſe objects be printed on the retina inverted, as it is neceſſary to print a book properly, that the types be previouſly ſet backward.

As for the anecdote related in proof of this doctrine, of the gentleman born blind, who was cured by Mr. Cheſelden, if it proves any thing, it only proves the ſenſe of ſeeing to be a ſpecies of *feeling*. The ſupporters of theſe theories might as well quote the caſe of the blind man whom our Saviour cured, but who, before his cure was quite completed, "ſaw men as *trees* walking." The anecdote is as follows: "To a young gentleman who was born blind, and who was cured by Mr. Cheſelden, every object (as he expreſſed himſelf) ſeemed to *touch* his eyes, as what he felt did his ſkin, and he thought no objects ſo agreeable as thoſe which were ſmooth and regular, although for ſome time he could form no judgment of their ſhape, or gueſs what it was in any of them that gave him pleaſure."

Now, if this young gentleman, for ſome time after his cure, had actually ſeen objects *double* or *inverted*, or both, the anecdote would really have afforded a deciſive evidence of the truth of one or both of theſe hypotheſes; but as neither of theſe circumſtances took place, but only a ſenſation of agreeable *feeling*, (a ſimile very naturally drawn, by a man born blind, from the exerciſe of that ſenſe, which he had been hitherto moſt *habituated* to exert,) it appears perfectly evident that both theories are totally groundleſs, and quite unſupported by fact.

To paint objects diſtinctly on the retina, the cornea is required to have ſuch a degree of convexity, that the rays of light may be collected at a certain point, ſo as to terminate exactly on the retina. If the cornea is too prominent, the rays by diverging too ſoon, will be united before they reach the retina, as is the caſe with *myopes*, or *near-ſighted* people; and on the contrary, if it is not ſufficiently convex, the rays will not be perfectly united when they reach the back part of the eye; and this happens to long-ſighted people, who in medical language, are called *preſbytæ*, or *old people*; as this circumſtance is found conſtantly to take place as we approach to old age, when the eye gradually flattens. Theſe defects are only to be ſupplied by glaſſes. Thoſe who are ſhort-ſighted will find their viſion improved by concave glaſſes; and thoſe who are too long-ſighted will find equal advantage from uſing convex ones. On the whole, the medium between the ſhort and long ſight is the beſt, by which a perſon can ſee diſtinctly enough objects that are both near and remote; and of this kind we reckon an eye that is able to read diſtinctly at the diſtance of one foot. But to conſtitute a good eye requires other conditions, ſuch as a perfect clearneſs of the humours; a due mobility of the eye itſelf, and its parts; a ſenſibility of the pupil, and a retina neither too *prurient* nor too callous.

Thus we have given a conciſe but comprehenſive account of the human body, with all its various organs; and we flatter ourſelves nothing material has been omitted. Theſe, however, who wiſh to conſult more extenſive treatiſes on the ſubject, muſt be referred to theſe eminent authors, who have been repeatedly mentioned in the courſe of this treatiſe, and particularly in our introduction.

EXPLANATION OF THE ANATOMICAL FIGURES IN PLATE IX.

FIG. 1. *A view of the Gall-bladder and its Ducts.*—1. The gall-bladder. 2. Ductus ciſticus. 3. Ductus hepaticus. 4. Ductus pancreaticus. 5. The entrance of the ductus communis into the duodenum.

FIG. 2. *Arteries; with a View of the Ramifications of the Meſenterica Superior.*—1. Part of the deſcending aorta. 2. Arteria cœliaca. 3. Meſenterica ſuperior. 4. Emulgentes. 5. Spermaticæ. 6. Some of the branches of the meſenterica inferior that are beſtowed upon the inteſtines.

FIG. 3. *A ſpecimen of the* ANDROGYNI, *in an Hermaphrodite, whoſe ſhape was rather female than male, but who was too young to have female breaſts, or a beard like a male,*

male. 1. The glans clitoridis. 2. Nymphæ. 3. Labia with teſticles in them, divaricated to ſhew the parts between. 4. The entrance into the vagina. 5. Furca virginis.

ANATOMY OF BRUTES. See COMPARATIVE ANATOMY.

ANATOMY OF PLANTS may be conſidered as a branch of comparative anatomy, otherwiſe called *dendronatomy.* The parts of plants which come under anatomical conſideration are, the roots, wood, bark, pith, fruit, leaves, flowers, &c. The anatomy of vegetables is chiefly owing to the induſtry of Malpighi, and Dr. Grew, though conſiderably promoted by Ruyſch, who by a peculiar method of injection produced divers ſkeletons or ſyſtems of veſſels of fruit, leaves, and the like. See PLANTS.

ANCESTOR, *n. s.* one from whom a perſon deſcends.

ANCESTREL, *adj.* claimed from anceſtors; a term of law.

ANCESTRY, *n. s.* 1. Lineage; a ſeries of anceſtors, or progenitors.—2. The honour of deſcent; birth.

ANCHOR, *n. s.* 1. A heavy iron to hold the ſhip, by being fixed to the ground.—2. It is uſed, by a metaphor, for any thing which confers ſtability or ſecurity. The conſtruction of the firſt anchors, like that of the firſt veſſels for navigation muſt, no doubt, have been extremely rude, and but little adapted to the purpoſes for which they were intended. Thoſe uſed in the moſt ancient times are ſaid to have been of ſtone, and ſometimes of wood, to which a great quantity of lead was uſually fixed. Baſkets full of ſtones and ſacks filled with ſand were likewiſe uſed for the ſame purpoſe; and being let down by chords into the ſea, by their weight, ſtaid the courſe of the ſhip. But as men became more experienced in the art of navigation, they at laſt formed their anchors of iron, and furniſhed them with teeth, which laying faſt hold on the bottom of the ſea, kept the veſſel immoveable. Inſtead, however, of detaining our readers with a detail of the rude attempts which were made by the ancients for this purpoſe, we ſhall proceed to a deſcription of thoſe uſed in modern times. The anchors now made are contrived ſo as to ſink into the ground as ſoon as they reach it, and to hold a great ſtrain before they can be looſened or diſlodged from their ſtation. They are compoſed of a ſhank, a ſtock, a ring, and two arms with their flooks. The ſtock, which is a long piece of timber fixed acroſs the ſhank, ſerves to guide the flooks in a direction perpendicular to the ſurface of the ground; ſo that one of them ſinks into it by its own weight as ſoon as it falls, and is ſtill preſerved ſteadily in that poſition by the ſtock, which, together with the ſhank, lies flat on the bottom. In this ſituation it muſt neceſſarily ſuſtain a great effort before it can be dragged through the earth horizontally. Indeed this can only be effected by the violence of the wind or tide, or both of them, ſometimes increaſed by the turbulence of the ſea, and acting upon the ſhip ſo as to ſtretch the cable to its utmoſt tenſion, which accordingly may diſlodge the anchor from its bed, eſpecially if the ground be ſoft and oozy, or rocky. When the anchor is thus diſplaced, it is ſaid in the ſea-phraſe, to *come home.* That the figure of this uſeful inſtrument may be more clearly underſtood, a repreſentation of it is given in plate V. No. 1. It conſiſts of a long maſſy beam of iron erected perpendicularly, *b*, at the lower end of which are two arms, *d e*, of equal thickneſs with the beam (uſually called the *shank*,) only that they taper towards the points, which are elevated above the horizontal plane at an angle of 30 degrees, or inclined at the ſhank at an angle of 60 degrees; on the upper part of each arm (in this poſition) is a flook or thick plate of iron, *g h*, commonly ſhaped like an iſoſceles triangle, whoſe baſe reaches inwards to the middle of the arm. On the upper end of the ſhank is fixed the ſtock tranſverſely with the flooks; the ſtock is a long beam of oak, *f*, in two parts, ſtrongly bolted and hooped together with iron rings. See No. 2. Cloſe above the ſtock is the ring *a*, to which the cable is faſtened, or *bent:* the ring is curiouſly covered with a number of pieces of ſhort rope, which are twiſted about it ſo as to form a very thick texture or covering called the *puddening*, and uſed to preſerve the cable from being fretted or chafed by the iron. Every ſhip has, or ought to have, three principal anchors, with a cable to each, viz. the ſheet, *maitreſſe-ancre*, (which is the *anchora sacra* of the ancients); the beſt bower, *second ancre;* and ſmall bower, *ancre d'affourche*, ſo called from their uſual ſituation on the ſhip's bows. There are beſides ſmaller anchors, for removing a ſhip from place to place in a harbour or river, where there may not be room or wind for ſailing; theſe are the ſtream-anchor, *ancre de toue;* the kedge and grappling, *grapin:* this laſt, however, is chiefly deſigned for boats. In the making of an anchor, great care is to be taken, that the metal be neither too ſoft nor too brittle; the latter rendering it liable to break and the former to ſtraiten. The ſhank, arms, and flooks, are firſt forged ſeparately; then the hole is made at one end of the ſhank for the ring, which being alſo previouſly forged, is put into the hole of the ſhank, and the two ends ſhut together. After which the arms are ſhut to the ſhank, one after the other, and the anchor is finiſhed. Proof is made of anchors, by raiſing them to a great height, and then letting them fall again on a kind of iron block placed acroſs for the purpoſe. To try whether the flooks will turn to the bottom and take hold of the ground, they place the anchor on an even ſurface, with the end of one of the flooks, and one of the ends of the ſtock reſting on the ſurface; in caſe the anchor turns, and the point of the flook riſes upwards, the anchor is good. For the proportions of anchors, according to Manwaring, the ſhank ſhould be thrice the length of one of the flooks, and half the length of the beam. According to Aubin, the length of the anchor ſhould be four tenths of the greateſt breadth of the ſhip; ſo that the ſhanks, *e. gr.* of an anchor in a veſſel 30 feet wide, is to be 12 feet long. When the ſhank is, for inſtance, eight feet long, the two arms are to be ſeven feet long, meaſuring them according to their curvity. The latter writer, however, obſerves, that the anchor of a large heavy veſſel is ſmaller, in proportion, than that of a leſſer and lighter one. The reaſon he gives is, that though the ſea employs an equal force againſt a ſmall veſſel as againſt a great one, ſuppoſing the extent of wood upon which the water acts to be equal in both, yet the little veſſel, by reaſon of its ſuperior lightneſs, does not make ſo much reſiſtance as the greater; the defect whereof muſt be ſupplied by the weight of the anchor.

To **ANCHOR,** *v. a.* 1. To place at anchor.—2. To fix on.

ANCHORAGE, *n. s.* 1. The hold of the anchor.—2. The ſet of anchors belonging to a ſhip.—3. The duty paid for liberty of anchoring in a port. Anchorage alſo ſignifies ground fit to hold a ſhip's anchor, ſo that ſhe may ride ſafely.

ANCHORET, } [contracted from *anachoret.*] a recluſe; ANCHORITE, } a hermit; one who retires to the more ſevere duties of religion.

ANCHOVY, *n. s.* a little ſea fiſh, much uſed by way of ſauce, or ſeaſoning. Scaliger deſcribes it as of the herring kind, about the length of a finger, having a pointed ſnout, a wide mouth, no teeth, but gums as rough as a ſaw. Some make it a ſort of ſardine, or pilchard; but others, with better reaſon, hold it a peculiar ſpecies, very different from either. They are taken in great quantities in the Mediterranean, where they are pickled, and afterwards ſent abroad to different countries.

ANCIENT, *adj.* 1. Old; not modern.—2. Old; that has been of long duration.—3. Paſt; former.

Ancient, *n. s.* 1. The flag or ſtreamer of a ſhip, and, formerly, of a regiment.—2. The bearer of a flag; whence in preſent uſe, enſign.

Ancients, *n. s.* thoſe who lived in old times, oppoſed to the moderns.

ANCIENTLY, *adv.* in old times.

ANCIENTNEES, *n. s.* antiquity; exiſtence from old times.

ANCIENTRY, *n. s.* the honour of ancient lineage; the dignity of birth.

ANCLE. See Ankle.

ANCONA, a ſea-port and the capital of the diſtrict of that name, ſituated in the Pope's territories in Italy. It is the ſee of a biſhop, and lies 15 m. N. of Loretto, and 130 N. of Rome. It was formerly the fineſt port in all Italy, being built by the emperor Trajan, about the year 115; but was almoſt ruined, and its trade loſt; though it has again revived through the patronage of Clement XII, who made it a free port, and built a vaſt mole, for the ſecurity of the harbour, which is now the beſt in all the pope's dominions. The town lies round it on two hills; one of which is at the point of Cape St. Syriaco, from whence there is a delightful proſpect. On the other ſtands the citadel, which commands the town and harbour. The triumphal arch of Trajan, which was built upon the mole, remains almoſt entire, with its inſcription, and is reckoned one of the moſt beautiful monuments of ancient Roman grandeur exiſting. There are about 5000 Jews ſettled in this city, where they have a ſynagogue; and although all religions are tolerated, theirs is the only foreign worſhip allowed to be publicly exerciſed. In 1796, the inhabitants renounced their allegiance to the Pope, who ſent a large army to ſubdue them; but the French, under Gen. Victor, having arrived, ſurrounded them and took the whole priſoners. Ancona now conſtitutes a part of the Italian republic. Long. 90. 5. E. Lat. 43. 36. N.

ANCONY, *n. s.* [in the iron mills.] A bloom wrought into the figure of a flat iron bar, about three feet long, with two ſquare round knobs, one at each end.

ANCYRA. See Angoura.

AND, *conjunction.* The particle by which ſentences or terms are joined, which is not eaſy to explain by any ſynonimous.

ANDALUSIA, the moſt weſtern province of Spain, bounded on the N. by Eſtremadura, on the E. by Granada and Murcia; on the S. by the ſtraits of Gibraltar, and the Atlantic Ocean, and on the W. by Alentejo and Algarva in Portugal, from which it is ſeparated by the river Guadiana. It is about 220 miles long, and 150 broad, and is the moſt fertile and commericial country in Spain. The capital is Seville.

Andalusia New, a diviſion of the province of Terra Firma, in S. America, whoſe boundaries cannot be well aſcertained, as the Spaniards pretend a right to countries in which they have never eſtabliſhed any ſettlements. According to the moſt reaſonable limits, it extends in length 500 miles from N. to S. and about 270 in breadth from E. to W. The interior country is woody and mountainous, variegated with fine valleys that yield corn and paſturage. The produce conſiſts chiefly in dying-drugs, gums, medicinal roots, brazil wood, ſugar, tobacco, and ſome valuable timber; and on its coaſts there are, likewiſe, ſome valuable pearl fiſheries.

ANDAMAN, or Andeman Iſlands, in the E. *Indies*, ſituated about 80 leagues diſtance from Tanaſſerim on the coaſt of Siam. They are but little known; only the Eaſt India ſhips ſometimes touch at them, and are ſupplied by the natives with rice, herbs, and fruits: The inhabitants are by ſome repreſented as an harmleſs inoffenſive race of men, and by others as canibals. Long. 167 E. Lat. from 10. to 15. N.

ANDES, a vaſt chain of mountains in South America, extending from the moſt northern part of Peru, to the Straits of Magellan, a diſtance of upwards of 4000 miles. The Spaniards call them the *Cordillera de los Andes;* they form two ridges, the lowermoſt of which is overſpread with woods and groves, and the uppermoſt covered with everlaſting ſnow. The following is the account given of one of thoſe mountains, which is called Pichincha, by the mathematicians, ſent by the kings of France and Spain, to make obſervations, in relation to the figure of the earth. Soon after, our artiſts arrived at Quito, they *determined to continue* the ſeries of the triangles for *meaſuring an arch of* the meridian to the S. of that city: the company accordingly divided themſelves into two bodies, conſiſting of French and Spaniards, and each retired to the part aſſigned them. Don George Juan, and M. Godin, who were at the head of one party, went to the mountain of Pambamarca; while M. Bougeur, de la Condamine, and Don Ulloa, together with their aſſiſtants, climbed up to the higheſt ſummit of Pichincha. Both parties ſuffered extremely from the ſeverity of the cold, and the impetuoſity of the winds, which, on theſe heights, blow with inceſſant violence; tho' they are ſituated in the torrid zone, and nearly on the equator. Their firſt ſcheme, for ſhelter and lodging, was to pitch a field tent for each company; but on Pinchincha, this could not be done, from the narrowneſs of the ſummit: they were therefore obliged to be contented with a hut, ſo ſmall, that they could hardly all creep into it. The aſcent up this ſtupendous rock, was ſo craggy, as only to be climbed on foot; and to perform it, coſt them many hours continual labour and pain, from the violent efforts of the body, and the ſubtility of the air; the latter being ſo pure, as to render reſpiration difficult. Our philoſophers during the time they continued here, were obliged to keep themſelves almoſt conſtantly in their hut, on account of the intenſeneſs of the cold, and their being continually involved in ſo thick a fog, that an object at ſix or eight paces, was hardly diſcernible. When the fog cleared up, the clouds, by their gravity, moved nearer to the ſurface of the earth, and on all ſides ſurrounded the mountains to a vaſt diſtance, repreſenting the ſea, with their rock, like an iſland, in the centre of it. When this happened, they heard the horrid noiſes of the tempeſts, which then diſcharged on Quito and the neighbouring country. They ſaw the lightnings iſſue from the clouds, and heard the thunders roll far beneath them; and whilſt the lower parts were involved in tempeſts of thunder and rain, they enjoyed a delightful ſerenity; the wind was abated, the ſky clear, and the enlivening rays of the ſun moderated the ſeverity of the cold. But their circumſtances were very different, when the clouds roſe: their thickneſs rendered reſpiration difficult; the ſnow and hail fell continually; and the wind returned with all its violence; ſo that it was impoſſible entirely to overcome the fears of being, together with their hut, blown down the precipice, on whoſe edge it was built, or of being buried under it, by the daily accumulations of ice and ſnow. The wind was often ſo violent that its velocity dazzled the ſight, whilſt their fears were increaſed, from the dreadful concuſſions of the precipice, cauſed by the fall of enormous fragments of rocks. Theſe craſhes were the more alarming, as no other noiſes are heard in theſe deſarts: and during the night, their reſt, which they ſo greatly wanted, was frequently diſturbed by ſuch ſudden ſounds. When the weather was any thing fair with them, and the clouds gathered about ſome of the other mountains, which had a connection with their obſervations, ſo that they could not make all the uſe they deſired, of this interval of good weather, they left their hut to exerciſe themſelves. Sometimes they deſcended to ſome ſmall diſtance; and at other times, amuſed themſelves with rolling large fragments of rocks down the precipice. But they always took care, in their excurſions, not to go ſo far out, but that, on the leaſt appearance of the clouds gathering about their cottage, which often happened very ſuddenly, they could regain their ſhelter. The door of their hut was faſtened with thongs of leather, and on the inſide, not the ſmalleſt crevice was left unſtopped; beſides which it was very compactly covered with ſtraw: but, notwithſtanding all their care, the wind penetrated through. The days were often little better than the nights; and all the light they enjoyed, was that of a lamp or two, which they kept continually burning. Though their hut was ſmall, and crowded with inhabitants, beſides the heat of the lamps; yet the intenſeneſs of the cold was ſuch, that every one of them was obliged to have a chafing diſh of coals. Theſe precautions would have rendered the rigour of the climate ſupportable, had not the imminent danger of periſhing, by being blown down the precipice, rouſed them, every time it ſnowed, to encounter the ſeverity of the outward air, and ſally out, with ſhovels, to free the roof of their hut from the maſſes of ſnow which were gathering on it. Nor would it, without this precaution, have been able to ſupport the weight. The reader may eaſily judge what they ſuffered from the aſperities of ſuch a climate. Their feet were ſwelled, ſo that walking was attended with extreme pain. Their hands were covered with chilblains; their lips ſwelled and chopped; ſo that every motion in ſpeaking, or the like drew blood. Their common food was a little rice boiled, with ſome fleſh or fowl, procured from Quito; and, inſtead of fluid water, their pot was filled with ice; they had the ſame reſource with regard to what they drank; and while they were eating, every one was obliged to keep his plate over a chafing-diſh of coals, to prevent his proviſions from freezing. The ſame was done with regard to the reſt. Our philoſophers ſpent no fewer than twenty-three tedious days on this rock, without any poſſibility of finiſhing their obſervations of the angles; for when it was fair and clear weather with them, the others, on whoſe ſummits the ſignals which formed the triangles for meaſuring the degrees of the meridian, were hid in the clouds; and when thoſe were clear, Pichincha was involved in clouds. It was therefore neceſſary to erect their ſignals in a lower ſituation, and in a more favourable region. This, however, did not produce any change in their habitation till the beginning of December; when, having finiſhed the obſervations which particularly concerned Pichincha, they proceeded to others; but with no abatement either of inconveniences, cold, or fatigue; for the places where they made their obſervations being neceſſarily on the higheſt parts of the deſarts, the only reſpite in which they enjoyed ſome little eaſe was during the ſhort interval of paſſing from one to the other. In all their ſtations ſubſequent to that on Pichincha, during their fatiguing menſuration of the degrees of the meridian, each company lodged in a field-tent, which though ſmall, they found leſs inconvenient than the hut on Pichincha; though at the ſame time they had more trouble, being oftener obliged to clear it from the ſnow, as the weight of it would otherwiſe have demoliſhed the tent. At firſt, indeed, they pitched it in the moſt ſheltered places; but on taking a reſolution that the tents themſelves ſhould ſerve for ſignals, to prevent the inconvenience of having others of wood, they removed them to a more expoſed ſituation, where the impetuoſity of the winds ſometimes tore up the piquets, and blew them down. Though this mountain is famous for its great height, it is conſiderably lower than the mountain of Cotopaxi: but it is impoſſible to conceive the coldneſs of the ſummit of the laſt mentioned mountain from that felt on this; ſince it muſt exceed every idea that can be formed by the human mind, though they are both ſeated in the midſt of the torrid zone. In all this range of mountains, there is ſaid to be a conſtant inferior boundary, beyond which the ſnow never melts: this boundary, in the midſt of the torrid zone, is ſaid by ſome to be 2434 fathoms above the level of the ſea; by others, only 2400 feet. The ſnow indeed falls much lower, but then it is ſubject to be melted the very ſame day. It is affirmed, that there are in the Andes 16 volcanoes or burning mountains, which throw out fire and ſmoke with a terrible noiſe. The height of Chimborazo, ſaid to be the higheſt peak of the Andes, has been determined by geometrical calculations to be 20,282 feet. But the great differences between the calculators of the height of mountains in other parts of the world muſt very much diminiſh the credit of ſuch calculations. Inſtances of this we have already given under the article ÆTNA. No leſs remarkable are the differences concerning the height of the peak of Teneriffe; which, according to the calculations of Varenius, is three miles and three quarters, or 19,800 feet; according to thoſe of Dr. Heberden, it is only 15,396 feet; and according to thoſe of M. Feuille, is no more than 13,128 feet. As all or moſt rivers have their ſource in mountains, it is no wonder a great number run down the ſides of the Andes. Some hurry along with a prodigious rapidity; while others form beautiful caſcades, or run through holes in rocks, which look like bridges of a ſtupendous height. There is a public road through the mountains, 1000 miles in length, part of which runs from Quito to Cuſco.

ANDOVER, a flouriſhing town in Eſſex county, Maſſachuſetts, ſituated on the Shawſheen river. It is divided into two pariſhes, and agreeably to the cenſus of 1790, contained 2863 inhabitants. In the ſouth pariſh, are a paper-mill, and a powder mill; the latter of which ſupplied great quantities of gun powder to the American army, during the revolutionary war. In this town, there is, likewiſe, an extenſive ſeminary of learning, called "*Philip's Academy*," which owes its exiſtence to the liberality of the family, whoſe name it bears. It is a large and commodious building, and ſtands on an eminence which commands an agreeable proſpect of the adjacent country. Andover is under excellent cultivation, particularly that part, which is watered by Shawſheen river. It lies about 20 miles S. W. of Newbury-port, 22 miles N. from Boſton, and 367 N. E. from Philadelphia, Lat. 42. 40. N. Lon. 3. 52. E. There are, likewiſe ſeveral other places of the ſame name, in different parts of the United States, viz. 1. the townſhip of Andover, in the South Weſtern part of Windſor county, Vermont. 2. Andover townſhip in Hillſborough county New-Hampſhire. 3. The plantation of Andover, in York county, in the diſtrict of Maine.

ANDREW, St. the apoſtle, brother to Simon Peter. His hiſtory ſo far as is recorded in the goſpels, it would be unneceſſary to repeat here. After our Saviour's aſcenſion, his apoſtles having determined by lot, what parts of the world, they ſhould ſeverally take, Scythia and the neighbouring countries fell to St. Andrew, who according to Euſebius, after he had planted the goſpel in ſeveral places, came to Patræ, in Achaia, where he was crucified by order of the pro-conſul Ægeas, for having attempted to convert him. The preciſe year of his martyrdom is not known; but all thoſe Chriſtian churches, which obſerve days dedicated to ſaints, agree in celebrating his anniverſary on the 30th November. His body was interred at Patræ, but afterwards removed to Conſtantinople, by Conſtantine the great, and buried in the great church, which he had built in honour of the apoſtles. Previous to the late revolution in France, there was a croſs in the church of St. Victor, at Marſeilles, which was believed by the multitude to be that, on which St. Andrew was crucified. It was in the ſhape of the letter X and incloſed in a ſilver ſhrine; but in conſequence of the great change, which, during that period, took place in the public mind, it is highly probable, that the ſhrine has like many others of the ſame kind, been converted into circulating ſpecie, and that the croſs, inſtead of being the object of general veneration, has been committed to the flames with as little ceremony as common wood. St. Andrew is conſidered as the tutelar ſaint of Scotland. See next article.

ANDREWS, St. a royal borough of Fifeſhire, Scotland, formerly the metropolis of the Pictiſh kingdom. If we may credit the legend, St. Andrew's owes its origin to a ſingular accident. St. Regulus, or St. Rule, as he is likewiſe called, a Greek of Achaia, was warned by a dream to viſit the iſland of Albion (now Great Britain) and to take with him part of the bones of St. Andrew. In conſequence of this viſion, he ſet ſail, and was ſhipwrecked on the coaſt of Otholania, in the territories of Ungus, king of the Picts, in the year 370. On hearing of the arrival of the ſaint with theſe precious relicts, the king received him with the utmoſt veneration, preſented him with his own palace, and built near it the church, which ſtill bears the name of St. Regulus. At this time the place was ſtiled *Mucroſs*, or the land of boars: all round was foreſt and the lands beſtowed on the ſaint were called *Byrebid*. St. Regulus changed the name to *Kilrymont*; and eſtabliſhed here the Chriſtian prieſts of the country called *Culdees*. This church was ſupreme in the kingdom of the Picts, Ungus having granted to God and St. Andrew, that it ſhould be the head and mother of all the churches in his dominions. He alſo directed, that the croſs of St. Andrew ſhould become the badge of the country. In the year 518, after the Scots had driven out the Picts, the name of this epiſcopal ſee was changed to St. Andrews, in honour of the ſaint, whoſe bones were there depoſited, and the biſhop was ſtyled *maximus Scotorum epiſcopus* "primate of the Scotch." The town of St. Andrew was erected into a royal borough, in the year 1140, and previous to the reformation was a place of great trade, wealth and ſplendour: ſince that period, however, it has been greatly on the decay. Its preſent population, as ſtated in the ſtatiſtical account of Scotland, amounts to 2519. The cathedral, the priory, and the caſtle of St. Regulus, muſt have been magnificent ſtructures, as is evident from thoſe of their ruins, which ſtill remain. The former of theſe was founded in 1161, but did not attain its full magnificence till 1318. Its length from E. to W. was 370 feet; that of the tranſept 232. But though this vaſt pile was 157 years in building, it was, in 1559, demoliſhed in one ſingle day, by a mob, whoſe minds were inflamed by a ſermon preached by John Knox, a man well known in the hiſtory of the reformation of Scotland. The remains of the caſtle are ſtill to be ſeen on the eaſt ſide of the city, on a rock overlooking the ſea. This fortreſs was founded in 1401, and became afterwards the ſcene of the cruelty and puniſhment of Cardinal Beaton. The window is ſhewn, out of which it is ſaid the cardinal looked to glut his eyes with the cruel death of George Wiſhart, who was burnt on a ſpot beneath; and in this very caſtle the cardinal was afterwards aſſaſſinated in 1546. Since the reformation there has been but little trade or manufactures in this city; but it ſeems of late years to be beginning to emerge. In 1792 a factory was eſtabliſhed for ſewing and tambouring muſlin, and in the year following they had 110 apprentices. But the chief ſupport of this city is the univerſity, which is the oldeſt in Scotland, and was founded in 1411. It formerly conſiſted of three colleges; but two of theſe were in 1747, united into one by act of parliament. This univerſity has for many years been filled with able profeſſors in the different ſciences, who are equally indefatigable in their attention to the inſtruction of the ſtudents, and to that eſſential article their morals. The harbour of St. Adrews, which has only 7 or 8 feet water, is artificial, and guarded by piers with a narrow entrance, to give ſhelter to veſſels, from the violence of a very heavy ſea, by the encroachments of which it has ſuffered much. This city is 30 miles N. E. of Edinburgh. Lat. 56. 18. N. Long. 72. 31. E.

Andrews, St. a townſhip ſituated in the conteſted territory between New-Brunſwick and the diſtrict of Main, on the eaſt ſide of Schoodick river, at its entrance into Paſſamaquoddy bay. A poſt office is eſtabliſhed here, which opens a direct communication between the Britiſh dominions and the United States. The town is regularly laid out in the form of an oblong ſquare, and its few inhabitants are chiefly employed in the lumber trade. The common tides riſe here about 18 feet. It is 747 miles N. E. from Philadelphia.

Andrews, St. a pariſh of Charleſton diſtrict, South-Carolina, which according to the cenſus of 1790, contained 2947 inhabitants of whom 2546 were ſlaves. It is watered by Aſhley river, and lies immediately above Charleſton. There are ſeveral other places of the name of St. Andrews, in the United States, as well as in the eaſtern world, but they ſeem too inſignificant to deſerve notice.

ANDRI. See Andros.

ANDROGINAL, *adj.* hermaphroditical. In zoology, this appellation is given to animals, which have both the male and female ſex, in the ſame individual. In botany the term is applied to ſuch plants as bear both male and female flowers on the ſame root.

ANDROGINALLY, *adv.* in the form of hermaphrodites; with two ſexes.

ANDROGYNES, in natural hiſtory, a name given to thoſe human creatures, which, by a monſtrous formation of their generative parts, ſeem (for it is only ſeeming) to unite in themſelves the two ſexes, that of the male and of the female. This *luſus naturæ*, this defect, or rather redundancy, in the animal ſtructure, is deſcribed by medical authors in the following manner. "There is a depravation in the ſtructure of the parts intended by nature for propagation, when, beſides thoſe concealed parts that are found neceſſary for the diſcharge of prolific functions, the *pudenda* of the other ſex likewiſe appear. This monſtrous production of nature is diverſified in four different ways; of which three appear in males and one in females. In men, the female pudendum, cloathed with hair, ſometimes appears contiguous to the perinæum; at other times, in the middle of the ſcrotum; at other times, which conſtitutes the third diverſity, through that part itſelf which in the midſt of the ſcrotum exhibits the form of a pudendum, urine is emitted. Near that part which is the teſt of puberty, and above the pudendum, even in females, the maſculine genitals appear in ſome, conſpicuous in all their three forms, one reſembling the *viretram* or yard, the other the two teſticles: but for the moſt part it happens, that, of the two inſtruments of generation, one is feeble and inert; and it is extremely rare that both are found ſufficiently valid and proper for feats of love; nay, even in a great many, both theſe members are deficient and impotent, ſo that they can perform the office neither of a male nor of a female." See Hermaphrodites.

ANDROGINOUS, *adj.* the ſame with *androginal*.

ANDROIDES, in mechanics, a human figure, which by certain ſprings or other movements, is capable of performing ſome of the natural motions of a living man. The motions of the human body are more complicated, and conſequently more difficult to be imitated, than thoſe of any other creature; whence the conſtruction of an *androides*, in ſuch a manner as to imitate any of theſe actions with tolerable exactneſs, is juſtly ſuppoſed to indicate a greater ſkill in mechanics than any other piece of workmanſhip whatever. A very remarkable figure of this kind appeared in Paris, in the year 1738. It repreſented a flute player, and was capable of performing many different pieces of muſic on the German flute; which, conſidering the difficulty of blowing that inſtrument, the different contractions of the lips neceſſary to produce the diſtinctions between the high and low notes, and the complicated motions of the fingers, muſt appear truly wonderful. This machine was the invention of M. Vaucanſon, member of the Royal Academy of Sciences; and a particular deſcription of it was publiſhed in the Memoirs of the Academy for that year. The figure itſelf was about five feet and an half in height, ſituated at the end of an artificial rock, and placed upon a ſquare pedeſtal four feet and an half high, and three and an half broad. The air entered the body by three pipes ſeparated one from another. It was conveyed to them by nine pair of bellows, three of which were placed above and ſix below. Theſe were made to expand and contract regularly in ſucceſſion, by means of an axis of ſteel turned round by ſome clock-work. On this axis were different protuberances at proper diſtances, to which were fixed cords thrown over pullies, and terminating in the upper boards of the bellows, ſo that, as the axis turned, theſe boards were alternately raiſed and let down. A contrivance was alſo uſed to prevent the diſagreeable hiſſing fluttering noiſe uſually attending the motion of bellows. This was by making the cord, by which the bellows was moved, preſs, in its deſcent, upon one end of a ſmaller lever, the other end of which aſcending forced open the ſmall leathern valve that admitted the air, and kept it ſo, till, the cord being relaxed by the deſcent of the upper board, the lever fell, and the air was forced out. Thus the bellows performing their functions conſtantly without the leaſt hiſſing or other noiſe by which it could be judged in what manner the air was conveyed to the machine. The upper boards of three of the pairs of bellows were preſſed down by a weight of four pounds, that of three others by a weight of two pounds, and thoſe of the three remaining ones by nothing but their own weight. The three tubes, by which the air entered, terminated in three ſmall reſervoirs in the trunk of the figure. There they united, and, aſcending towards the throat, formed the cavity of the mouth, which terminated in two ſmall lips adapted in ſome meaſure to perform their proper functions. Within this cavity alſo was a ſmall moveable tongue; which by its play, at proper periods, admitted the air, or intercepted its paſſage to the flute. The fingers, lips, and tongue, received their proper directions by means of a ſteel cylinder turned by clock-work. It was divided into 15 equal parts, which by means of pegs, preſſing upon the ends of 15 different levers, cauſed the other extremities to aſcend. Seven of theſe levers directed the fingers, having wires and chains affixed to their aſcending extremities, which being attached to the fingers, cauſed them to aſcend in proportion as the other extremity was preſſed down by the motion of the cylinder, and *vice verſa*. Thus the aſcent or deſcent of one end of a lever produce a ſimilar aſcent or deſcent in the correſponding finger, by which one of the holes of the flute was occaſionally opened or ſtopped, as by a living performer. Three of the levers ſerved to regulate the ingreſs of the air, being contrived ſo as to open and ſhut, by means of valves, and three reſervoirs of air above mentioned, ſo that more or leſs ſtrength might be given, and a higher or lower note produced as occaſion required. The lips were, by a ſimilar mechaniſm, directed by four levers, one of which opened them, to give the air a freer paſſage; the other contracted them; the third drew them backward; and the fourth puſhed them forward. The lips were projected upon that part of the flute which receives the air; and, by the different motions already mentioned, modified the tone in a proper manner.—The remaining lever was employed in the direction of the tongue, which it eaſily moved ſo as to ſhut or open the mouth of the flute. Thus we ſee how all the motions neceſſary for a German-flute-player could be performed by this machine; but a conſiderable difficulty ſtill remains, namely, how to regulate theſe motions properly, and make each of them follow in juſt ſucceſſion. This, however, was effected by the following ſimple method. The extremity of the axis of the cylinder was terminated on the right ſide by an endleſs ſcrew, conſiſting of 12 threads, each placed at the diſtance of a line and an half from the other. Above this ſcrew was fixed a piece of copper, and in it a ſteel pivot, which, falling in between the threads and the ſcrew, obliged the cylinder to follow the threads, and, inſtead of turning directly round, it was continually puſhed to one ſide. Hence, if a lever was moved, by a peg placed on the cylinder, in any one revolution, it could not be moved by the ſame peg in the ſucceeding revolution, becauſe the peg would be moved a line and an half beyond it by the lateral motion of the cylinder. Thus, by an artificial diſpoſition of theſe pegs in different parts of the cylinder, the ſtatue was made, by the ſucceſſive elevation of the proper levers, to exhibit all the different motions of a flute-player, to the admiration of every one who ſaw it. The conſtruction of machines capable of imitating even the mechanical actions of the human body, ſhew exquiſite ſkill; but what ſhall we ſay of one capable, not only of imitating actions of this kind, but of acting as external circumſtances require, as though it were endowed with life and reaſon? This, nevertheleſs, has been done. M. de Kempelen, a gentleman of Preſburgh in Hungary, excited by the performances of M. de Vaucanſon, at firſt endeavoured to imitate them, and at laſt far excelled them. This gentleman conſtructed an Androides capable of playing at cheſs!—Every one who is in the leaſt acquainted with this game muſt know, that it is ſo far from being mechanically performed, as to require a greater exertion of the judgment and rational faculties than is ſufficient to accompliſh many matters of greater importance. An attempt therefore, to make a wooden cheſs-player, muſt appear as ridiculous as to make a wooden preacher or counſellor of ſtate. That this machine really was made, however, was confirmed by occular demonſtration; the inventor, having in 1783, carried it with him to Great-Britain, where he exhibited it for upwards of a year. It is a figure as large as life, in a Turkiſh dreſs, ſitting behind a table with doors, of three feet and a half in length, two in depth, and two and a half in height. The chair on which it ſits is fixed to the table, which runs on four wheels. The automaton leans its right arm on the table, and in its left hand holds a pipe: with this hand it plays after the pipe is removed. A cheſs-board of 18 inches is fixed before it. This table, or rather cupboard, contains wheels, levers, cylinders and other pieces of mechaniſm; all which are publicly diſplayed. The veſtments of the automaton are then lifted over its head, and the body is ſeen full of ſimilar wheels and levers. There is a little door in its thigh, which is likewiſe opened; and with this, and the table alſo open, and the automaton uncovered, the whole is wheeled about the room. The doors are then ſhut, and the automaton is ready to play; and it always takes the firſt move. At every motion the wheels are heard; the image moves its head, and looks over every part of the cheſs-board. When it checks the queen, it *ſhakes* its head twice, and thrice in giving check to the king. *It likewiſe* ſhakes its head when a falſe move is made, replaces the piece, and makes its own move; by which means the adverſary loſes one. M. de Kempelen remarks as the moſt ſurpriſing circumſtance attending this automaton, that it had been exhibited at Preſburg, Vienna, Paris, and London, to thouſands, many of whom were mathematicians and cheſs-players, and yet the ſecret by which he governed the motion of its arm was never diſcovered. He prided himſelf ſolely on the conſtruction of the mechanical powers, by which the arm could perform 10 or 12 moves. It then required to be wound up like a watch, after which it was capable of continuing the ſame number of motions. The automaton could not play unleſs M. De Kempelin or his ſubſtitute was near it to direct its moves. A ſmall ſquare box, during the game, was frequently conſulted by the exhibiter; and herein conſiſted the ſecret, which he ſaid he could in a moment communicate. He who could beat M. de Kempelen was, of courſe, certain of conquering *the automaton*. It was made in 1769. His own account *of it was*: "*C'eſt* une bagatelle qui n'eſt pas ſans merite du cote du mechaniſme, mais les effets n'en paroiſſent ſi merveilleux que par la hardieſſe de Pidee, & par l'heureux chioz des moyens employs pour faire illuſion." The ſtrongeſt and beſt armed loadſtone was allowed to be placed on the machine by any of the ſpectators. As the inventor of this admirable piece of mechaniſm hath not yet thought proper to communicate to the public the means by which it is actuated, it is in vain for any, except thoſe who are exquiſitely ſkilled in mechanics, to form conjectures concerning them.—Many other curious imitations of the human body, as well as that of other animals, have been exhibited, though none of them are equal to the laſt mentioned one. See AUTOMATON.

ANDROMEDA, in botany, the MARSH CYSTUS: a genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 18th order, bicornes. The characters are: The calyx is a quinquepartite perianthium, ſmall, coloured, and perſiſtent: The corolla is monopetalous, campanulated, and quinquefid, with reflected diviſions: The ſtamina conſiſt of ten ſubulated filaments, ſhorter than the corolla; the antheræ two horned and nodding: The piſtillum has a roundiſh germen; a cylindric ſtylus larger than the ſtamina, and perſiſtent; and an obtuſe ſtigma; The pericarpium is a roundiſh five-cornered capſule, with five cells and five valves: The ſeeds are very numerous, roundiſh, and gloſſy. There are 15 ſpecies, of which the following are the principal.—*Species*—The ARBOREA is a native of Virginia and Carolina, where it is called the ſorrel tree. It grows to the height of 20 feet, with a trunk uſually five or ſix inches thick. The branches are ſlender, thick ſet with leaves, like thoſe of the pear tree. From the ends of the branches proceed many ſlender ſtalks, on the one ſide of which hang many ſmall white flowers, like thoſe of the ſtrawberry plant.—The CALYCULATA, is a native of Siberia, and likewiſe of North America. It grows on moſſy land, and is therefore very difficult to keep in gardens. The leaves are ſhaped like thoſe of the box tree, and are of the ſame conſiſtence, having ſeveral ſmall punctures on them. The flowers grow in ſhort ſpikes, from the extremity of the branches. They are produced ſingle, between two leaves, are of a white colour, and a cylindrical or pitcher like ſhape.—The MARIANA, a native of North America, is a low ſhrub, ſending out many woody ſtalks from the root, which are garniſhed with oval leaves, placed alternately; the flowers are collected in ſmall bunches, are of an herbaceous colour, and ſhaped like thoſe of the ſtrawberry tree. They appear in June and July.—The PANICULATA, is a native of Virginia and Carolina, growing in moiſt places. The plants uſually arrive at the height of ten feet, with thin leaves ſet alternately, and having their edges finely ſerrated. The flowers are tubulous , ſmall, and of a greeniſh white, cloſely ſet horizontally on one ſide of the ſlender ſtalks. Theſe flowers are ſucceeded by berries, which open when ripe, and divide into five ſections, incloſing many ſmall ſeeds. Plate 14. Fig. 2. The POLIFOLIA is a low plant, growing naturally in bogs in the northern countries. It is not eaſily preſerved in gardens; and, being a plant of no great beauty, is ſeldom cultivated. Theſe four laſt ſpecies are hardy plants. They ſucceed beſt, however, upon boggy and moiſt grounds.

ANDROPHAGI, a nation of cannibals, whoſe country, according to Herodotus, was adjacent to Scythia. They are repreſented, as the moſt barbarous and fierce of all nations. They were not governed by laws: the care of their cattle was their chief employment. Their dreſs was like that of the Scythians; and they had a language peculiar to themſelves. See ANTHROPOPHAGI.

ANDROPOGON, or MAN'S-BEARD, in botany: a genus of the monœcia order, belonging to the polygamia claſs; and in the natural method ranking under the 4th order, Gramina. The hermaphrodite calyx is a one-flowered bivalved glume: The corolla is a bivalved glume awn'd at the baſe: The ſtamina conſiſt of three capillary filaments; the anthera are oblong and bifurcated: The piſtillum has an oval germen; with two capillary ſtyli coaleſced, and villous ſtigmata: There is no pericarpium: The ſeed is one, ſolitary, and covered. The male calyx, corolla, and ſtamina, the ſame with the hermaphrodite; but the corolla without the awn.—There are above 18 ſpecies. Of theſe the moſt remarkable is the Nardus, which produces the Indian nard, or ſpikenard of the ſhops. The ſpikenard, as brought from the Eaſt-Indies, is a congeries of ſmall fibres iſſuing from one head, and matted cloſe together, ſo as to form a bunch about the ſize of the finger, with ſome ſmall ſtrings at the oppoſite end of the head. The matted fibres (which are the parts choſen for medicinal purpoſes) are ſuppoſed by ſome to be the head or ſpike of the plant, by others the root: they ſeem rather to be the remains of the withered ſtalks, or ribs of the leaves: ſometimes entire leaves and pieces of ſtalks are found among them: we likewiſe now and then meet with a number of theſe bunches iſſuing from one root. Spikenard has a warm, pungent, bitteriſh taſte; and a ſtrong, not very agreeable ſmell. It is ſtomachic and carminative; and ſaid to be alexipharmic, diuretic, and emmenagogue; but at preſent it is very little employed.

ANDROS, a rich, fertile and pleaſant iſland in the Archipelago, lying N. of Candia, and at the S. end of Negropont. The inhabitants are moſtly of the Greek church, who have a biſhop and ſeveral monaſteries. The Latins have alſo a biſhop and ſix churches. The houſes are ill-built; the air and water bad; yet they have neither phyſician nor ſurgeon. The inhabitants are civil; the women chaſte. The principal riches of the iſland conſiſt in ſilks, and the fields are pleaſant and fertile, being planted with oranges, mulberries, figs, pomegranates, cloves, &c. This iſland was known to the ancients by ſeveral names, as Antandros, Epagris, Hydruſia, Cauros, Laſia and Nonagria. About two miles from the preſent town are ſtill to be ſeen the ruins of a ſtrong wall, with the fragments of many columns, chapiters, baſes, broken ſtatues, and ſeveral inſcriptions, which mention the ſenate and people of Andros. from which it is probable, that this was the ſite of the ancient city, and abundantly prove its former magnificence. Long. 100. 10. E. Lat. 37. 50. N.

ANDROTOMY, *n. s.* the practice of cutting human bodies.

ANDRYALA, DOWNY-SOW THISTLE: A genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, compoſitæ-ſemifloſculus. The eſſential characters are: The receptacle is villous; the calyx is many parted, ſubequal, and rounded; and the pappus is ſimple and ſeſſile. The ſpecies are, 1. INTEGRIFOLIA, an annual plant, growing naturally in the South of France, Spain, and Italy. 2. LANATA is a native of Sicily and of the country round Montpelier. 3. RAGUSINA is a native of the Cape of Good Hope. 4. SINUATA which grows in Spain and Partugal. All theſe plants are eaſily propagated by ſeeds, which ſhould be ſown in Autumn, where they are to remain, and will require no other culture than to thin them where they are too cloſe, and to keep them free from weeds.

To ANEAL, *v. a.* to bake or harden glaſs, tiles, &c. in the fire.

To ANEAL, in metallurgy, to give gold, ſilver, or copper a red heat.

ANECDOTE, *n. s.* 1. Something yet unpubliſhed; ſecret hiſtory.—2. A biographical incident; a minute paſſage of private life.—3. A relation of detached and intereſting particulars.

ANEMOGRAPHY, *n. s.* the deſcription of the winds.

ANEMOMETER, *n. s.* an inſtrument contrived to meaſure the ſtrength or velocity of the wind.

ANEMOMETERS of various kinds have been invented different times, and by different perſons. The one, repreſented in Plate XIV. has been often experienced, and found to anſwer the intention.—An open frame of wood, ABCD EFGH, is ſupported by the ſhaft or arbor I. In the two croſs-pieces H K, L M, is moved a horizontal axis Q M, by means of the four ſails, *ab*, *em*, *Of*, *gh*, expoſed to the wind in a proper manner. Upon this axis is fixed a cone of wood, MNO; upon which, as the ſails move round, a weight, S, is raiſed by a ſtring round its ſuperficies, proceeding from the ſmaller to the larger end N O. Upon this larger end or baſe of the cone, is fixed a rocket wheel *k*, in whoſe teeth the click X falls, to prevent any retrogade motion from the depending weight.—The ſtructure of this machine ſufficiently ſhows that it may be accommodated to eſtimate the variable force of the wind; becauſe the force of the weight will continually increaſe as the ſtring advances on the conical ſurface, by acting at a greater diſtance from the axis of motion; conſequently, if ſuch a weight be added on the ſmaller part M, as will juſt keep the machine in equilibrio in the weakeſt wind, the weight to be raiſed as the wind becomes ſtronger, will be increaſed in proportion, and the diameter of the cone N O may be ſo large in compariſon to that of the ſmaller end at M, that the ſtrongeſt wind ſhall but juſt raiſe the weight at the greater end. If for example, the diameter of the axis be to that of the baſe of the cone N O as 1 to 28; then, if S be a weight of 1 pound at M on the axis, it will be equivalent to 28 pounds when raiſed to the greater end; if, therefore, when the wind is weakeſt, it ſupports one pound on the axis, it muſt be 28 times as ſtrong to raiſe the weight to the baſe of the cone. If therefore a line of ſcale of 28 equal parts be drawn on the ſide of the cone, the ſtrength of the wind will be indicated by that number on which the ſtring reſts.

ANEMONE, wind-flower, *n. s.* a genus of the polygamia order, belonging to the polyandria claſs of plants; and, in the natural method, ranking under the 26th order, Multiſiliquæ. It has its name from the Greek *anemos*, ſignifying the wind; becauſe the flower is ſuppoſed not to open unleſs the wind blows.—The characters are: There is no calyx: The corolla conſiſts of petals of two or three orders, three in each ſeries, oblongiſh: The ſtamina conſiſt of numerous capillary filaments; the antheræ didymous and erect. The piſtillum has numerous germina collected into a head; the ſtyli are pointed; the ſtigmata obtuſe: There is no pericarpium; the receptaculum is globular: The ſeeds are very numerous.—Of this genus Dr. Linnæus enumerates 21 ſpecies; but thoſe valuable on account of the beauty of their flowers are only the following:

1. Appenina, which is a native of Britain, and grows in woods. The flowers of this ſpecies are ſometimes ſingle, and ſometimes double; their colours are white, blue, or violet.

2. The Coronaria, } Theſe two are natives of the
3. The Hortensis, } Levant, particularly of the Archipelago iſlands, where the borders of the fields are covered with them of the moſt beautiful colours. When they grow wild, the flowers are commonly ſingle; but by culture they become large and double, making ſome of the greateſt ornaments of gardens. Their principal colours are red, white, purple, and blue; ſome of them are finely variegated with red, white, purple, and many intermediate ſhades of theſe colours.

4. The Nemorosa, which grows wild in the woods in many parts of Britain, where it flowers in April and May. The flowers are white, purple, or reddiſh purple, ſometimes ſingle, and ſometimes double, ſo that they make a pretty appearance.

Anemone, Sea. See Animal Flower.

ANEMOSCOPE, *n. s.* a machine invented to foretel the changes of the wind. This machine conſiſts of an index moving about an upright circular plate, like the dial of a clock, on which the 32 points of the compaſs are drawn inſtead of the hours. The index, which points to the diviſions on the dial, is turned by a horizontal axis, having a trundle-head at its external extremity. This trundle-head is moved by a cog-wheel on a perpendicular axis; on the top of which a vane is fixed, that moves with the courſe of the wind, and puts the whole machine in motion. The whole contrivance is extremely ſimple; and nothing required in the conſtruction, but that the number of cogs in the wheel, and round in the trundle-head, be equal; becauſe it is neceſſary, that when the vane moves entirely round, the index of the dial alſo make a complete revolution. An anemoſcope of this kind is placed on the weſt end of the regiſter office at Edinburgh. The anemoſcope calculated for indicating the force or velocity of the wind, is the ſame with what moſt writers call *anemometer*; and we have accordingly deſcribed one of thoſe machines under that article. We ſhall here add another by the late Mr. Pickering, and publiſhed in the *Philosophical Transactions* No. 473. This anemoſcope is a machine four feet and a quarter high, conſiſting of a broad and weighty pedeſtal, a pillar faſtened into it, and an iron axis of about half an inch diameter faſtened into the pillar. Upon this axis turns a wooden tube; at the top of which is placed a vane, of the ſame materials, 21 inches long, conſiſting of a quadrant, graduated, and ſhod with an iron rim, notched to each degree; and a counterpoiſe of wood, as in the figure on the other. Through the centre of the quadrant runs an iron pin, upon which are faſtened two ſmall round pieces of wood, which ſerve as moveable radii to deſcribe the degrees upon the quadrant, and as handles to a velum or ſail, whoſe plain is one foot ſquare, made of canvas, ſtretched upon four battens, and painted. On the upper batten, next to the ſhod rim of the quadrant, is a ſmall ſpring which catches at every notch correſponding to each degree, as the wind ſhall, by preſſing againſt the ſail, raiſe it up; and prevents the falling back of the ſail, upon leſſening of the force of the wind. At the bottom of the wooden tube, is an iron index, which moves round a circular piece of wood faſtened to the top of the pillar on the pedeſtal, on which are deſcribed the 32 points of the compaſs. The figure of this machine is given on Plate XIV. where *a* is the pedeſtal; *b*, the pillar on which the iron axis is fitted; *c*, the circle of wood, on which are deſcribed the 32 points of the compaſs; *e*, the wooden tube upon its axis; *f*, the velum; *g*, the graduated quadrant; *h*, the counterpoiſe of the vane. The adjoining figure repreſents the velum, which takes off: *a* is the plane of the velum; *b* the ſpring; *c* the wooden radii; *d d* the holes through which the pin in the centre of the quadrant goes.

Anemoscope, uses of the. Having a circular motion round the iron axis, and being furniſhed with a vane at top, and index at the bottom, when once the artificial cardinal points, deſcribed on the round piece of wood on the pillar, are fixed to the ſame quarters of the heavens, it gives a faithful account of that quarter from which the wind blows. 2. By having a velum or ſail, elevated by the wind, along the arch of the quadrant, to an height, proportionable to the power of the column of wind preſſing againſt it, the relative force of the wind, and its comparative power, at any two times of examination, may be accurately taken. 3. By having a ſpring fitted to the notches of the iron with which the quadrant is ſhod, the velum is prevented from returning back upon the fall of the wind; and the machine gives the force to the higheſt blaſt, ſince the laſt time of examination, without the trouble of watching it. The ingenious inventor of this machine tells us, that he carefully examined what dependence may be had upon it, during the ſtorms of February 1714, and found that it anſwered exceeding well; for that, in ſuch winds as the ſailors call violent ſtorms, the machine had ſix degrees to ſpare, for a more violent guſt, before it comes to a horizontal poſition. It is certainly to be depended upon in ordinary weather, the velum being hung ſo tenderly, as to feel the moſt gentle breeze. There is, however, reaſon to fear, that the expoſing the anemoſcope to all winds, for a continuance, muſt diſorder it, eſpecially irregular blaſts and ſqualls.

ANENT, *prep.* a word uſed in the Scotch dialect. 1. Concerning; about.—2. Over againſt; oppoſite.

ANES, Awns, *n. s.* the ſpires or beards of corn.

ANET, the herb, dill. See next article.

ANETHUM, dill and fennel: A genus of the digynia order, belonging to the pentandria claſs of plants; and, in the natural method, ranking under the 45th order, umbellatæ. The eſſential characters are: The fruit is oval, compreſſed, ſtriated; and the petals, 5, are involute, entire, and very ſhort. The ſpecies are,

1. Fœniculum, or fennel; of which there are two varieties, the common and the ſweet. The ſweet fennel is ſmaller in all its parts than the common, except the ſeeds, which are conſiderably larger. The ſeeds of the two ſorts differ likewiſe in ſhape and colour; thoſe of the common are roundiſh, oblong, flattiſh on one ſide, and protuberent on the other, of a dark, almoſt blackiſh colour; thoſe of the ſweet are longer, narrower, not ſo flat, generally crooked, and of a whitiſh or pale yellowiſh colour.

2. The Graveolens, or dill is an annual plant: the root is long, ſlender, and white: the leaves are divided into a multitude of fine, long, narrow ſegments like thoſe of fennel, but of a blueiſh green colour, and leſs ſtrong ſmell.—The ſtalk is round and firm, growing to the height of four feet, with yellow flowers, in moderately large umbels.

Medicinal uses. Of the firſt ſpecies, both the ſeeds and roots are uſed in medicine. The ſeeds of both the fennels have an aromatic ſmell, and a moderately warm pungent taſte: thoſe of the ſweet fennel are in flavour moſt agreeable, and have alſo a conſiderable degree of ſweetneſs; hence the beſt phyſicians have directed the uſe of theſe only. They are ranked among the four greater hot ſeeds, and not undeſervedly looked upon as good ſtomachics and carminatives. A ſimple water is prepared from them in the ſhops; they are ingredients alſo in the compound ſpirit of juniper, and ſome other officinal compoſitions. The root is far leſs warm, but has more of a ſweetiſh taſte, than the ſeeds: it is one of the five roots called *openers*; and has ſometimes been directed in aparient apozems. Boerhaave ſays, that this root agrees in taſte, ſmell, and medical qualities, with the celebrated *ginſeng* of the Chineſe; from which, however, it appears to be very conſiderably different. The leaves of fennel are weaker than either the roots or ſeeds, and have very rarely been employed for any medicinal uſe. 2. Of the laſt ſpecies, dill, only the ſeeds are uſed.—They are of a pale yellowiſh colour, in ſhape nearly oval, convex on one ſide, and flat on the other. Their taſte is moderately warm and pungent; their ſmell aromatic, but not of the moſt agreeable kind. Several preparations of them are kept in the ſhops. They are recommended as a carminative, in flatulent colics, proceeding from a cold cauſe, or a viſcidity of the juices.

ANEURISM, *n. s.* a diſeaſe of the arteries, in which, either by a preternatural weakneſs of any part of them, they become exceſſively dilated, or by a wound through their coats, the blood is extravaſated amongſt the adjacent cavities. Or it may be ſtill more accurately defined, a throbbing tumour, diſtended with blood, and formed by a dilatation or rupture of the artery. See Surgery.

ANEW, *adv.* 1. Over again; another time.—2. Newly; in a new manner.

ANFRACTUOSE, } *adj.* winding; mazy; full of
ANFRACTUOUS, } turnings and winding paſſages.

ANFRACTUOUSNESS, *n. s.* fullneſs of windings and turnings.

ANFRACTURE, *n. s.* a turning; a mazy winding and turning.

ANGEIOLOGY, in anatomy, the deſcription of the veſſels in a human body; *e. g.* the nerves, veins, and lymphatics.

ANGEIOTOMY, in ſurgery, implies the opening a vein or artery, as in bleeding; and conſequently includes both arteriotomy and phlebotomy.

ANGEL, *adj.* reſembling angels; Angelical.

Angel, *n. s.* 1. Originally a meſſenger. A ſpirit employed by God in the adminiſtration of human affairs.—2. *Angel* is ſometimes uſed in a bad ſenſe; as, *angels of darkneſs*.—3. *Angel*, in ſcripture, ſometimes means *man of God, prophet*.—4. In the ſtyle of love, for a beautiful perſon.—5. A piece of money anciently coined and impreſſed with an angel. The coin was rated at ten ſhillings ſterling.—Angels, in the proper ſignification of the word, do not import the nature of any being, but only the office, to which they are apointed, eſpecially by way of meſſage, or intercourſe between God and his creatures; in which ſenſe they are called the *miniſters of God*, who do his pleaſure, and *miniſtering ſpirits* ſent forth to miniſter for them who ſhall be heirs of ſalvation.—That there are ſuch beings as we call *angels*, that is, certain permanent exiſtences, inviſible, and imperceptible to our ſenſes, endued with underſtanding and power ſuperior to that of human nature, created by God, and ſubject to him as the ſupreme Being; miniſtering to his divine providence in the government of the world by his appointment, and more eſpecially attending the affairs of mankind; is a truth ſo fully atteſted by ſcripture, that it cannot be doubted. Nay, the exiſtence of ſuch inviſible beings was generally acknowledged by the ancient heathens, though under different appellations: the Greeks called them *dæmons;* and the Romans *genii* or *lares.* Epicurus ſeems to have been the only one among the old philoſophers, who, like Zadoc and his followers, the Sadducees, among the Jews, abſolutely denied their exiſtence. Indeed, the belief of middle intelligences influencing the affairs of the world, and ſerving as miniſters or interpreters between God and man, is as extenſive as the belief of a God; having never, ſo far as we know, been called in queſtion by thoſe who had any religion at all. Much idle controverſy, and many fruitleſs conjectures, have taken place among the learned, reſpecting the time when the angels were created. The majority of theological writers, ſeem to have taken it for granted, that their creation, though not mentioned by Moſes, conſtituted a part of the Almighty's ſix days work. Biſhop Hopkins inſiſts, that it *must* have been within the ſix days creation, becauſe within that ſpace, "God made heaven and earth, and *all* things that are therein." Lightfoot, Caryl, and others, lay great ſtreſs upon the words, Gen. ii. 1. "Thus the heavens and the earth were finiſhed, and *all the host* of them." And Dr. Charnock reckons the incipient words of the firſt chapter, "In the *beginning*" deciſive; "becauſe," ſays he, "before the beginning of the creation, and the beginning of time, there could be nothing but eternity; nothing but what was uncreated; that is, nothing but what was without beginning." This argument is evidently a play upon words; but the learned Dr. Gill argues ſtill more ridiculouſly, by aſking, "if angels were created *before* the heavens, (by which he muſt certainly mean the material viſible heavens,) *where* could they exiſt?"—As if infinite ſpace could not afford room for immaterial beings! Throughout the whole of this controverſy, theſe learned divines ſeem to have overlooked the chief, if not the ſole intention of revelation, which, they muſt all admit, is the ſalvation of mankind. The creation of man, and the globe he inhabits; his original ſtate, his fall, the promiſe of a Saviour, the hiſtory of the peculiar people, among whom the Saviour was to appear, their typical diſpenſations, and the ſeries of events connected therewith, &c. were neceſſary for that purpoſe, and therefore are particularly recorded and revealed. But the creation of angels, as well as of *devils;* the revolutions and magnitude of the planets; the nature of their inhabitants; and even the form of our own globe, with the particular hiſtory of its antediluvian and poſt-diluvian inhabitants, for the firſt 3000 years nearly, with many other things which curioſity might wiſh to pry into, not being neceſſary to man's ſalvation, are not revealed. Even the ſin of ſatan and his aſſociates, by which they fell from being angels of light, is but obſcurely hinted at in ſcripture, the knowledge of it not being neceſſary for that great object. From this general view of the intention of revelation, we cannot be ſurpriſed at the ſilence of Moſes upon the creation of angels, or that of the other inſpired writers, upon a variety of other ſubjects. But we have no reaſon to infer from that ſilence, that the angels did not exiſt long before the creation of our world. On the contrary, we have every reaſon to conclude, that not only angels and other immaterial beings, were created many ages before the creation of our globe, but that even myriads of ſtars had been created, and planets revolved in the immenſity of ſpace, many ages before the creation of our ſun, and the planets that circulate around him. Mr. Nichols, in his *Conference with a Theist* one of the moſt judicious works that have been wrote in modern times, to reconcile revelation with the facts of modern philoſophy, reſtricts the ſix days creation entirely to our ſublinary ſyſtem; and argues, that the clauſe, "he made the ſtars alſo," at the end of the 16th verſe of the 1ſt chap. of Geneſis, is evidently an interpolation; thrown in probably by ſome Jewiſh tranſcriber, who had wiſhed to ſupply what he thought an omiſſion of Moſes. Be that as it may, the Moſaic account of the creation, and the whole books of revelation, being wrote for the inſtruction of mankind in the way of ſalvation, and not in philoſophy, it was quite unneceſſary to mention theſe creations of other beings, and of other worlds, which had taken place long before; but only to ſtate the ſimple narrative of the creation of man, and of all thoſe things that were neceſſarily connected with his preſent ſtate of exiſtence. As for the word *All*, upon which ſo much ſtreſs is laid by divines, it can with as little reaſon be extended to all the works of the Almighty, throughout the infinity of ſpace, as a ſimilar expreſſion in Math. iii. 5. can be ſuppoſed to mean the *whole* inhabitants of Jeruſalem. The paſſage, if interpreted literally, would involve a contradiction to what we know to be the fact. "Then went out to him *Jerusalem and* ALL *Judea, and* ALL *the region* round about Jordan, and were baptiſed of him." As no judicious commentator will explain the word *all*, in this paſſage, to mean more than a great number of the people, ſo no Chriſtian philoſopher, who is acquainted with aſtronomy, will explain the words *all the host of them*, to imply more than the ſun and the planets in our ſubluſnary ſyſtem; which, conſidering *their magnitudes*, diſtances, and numbers, primary and ſecondary, (which, *from* the very late diſcovery of the *Herschel*, or Georgium *sidus*, are probably much greater than we have yet diſcovered,) ſufficiently merit the title of a *host*. Conſidering matters in this view, the argument drawn from the words *in the beginning*, will appear quite inconcluſive; for certainly the day of the creation of our globe, is the beginning of time to its inhabitants, and, as ſuch, the only proper æra for our ſacred hiſtorian to date his hiſtory from, if myriads of angels, and millions of other worlds, ſhould have been created and exiſted for many ages before it. Indeed to ſuppoſe, with the majority of divines, that no creatures whatever, neither material nor ſpiritual, neither angels nor other worlds, had been created previous to the creation of our world, is to ſuppoſe, that a Being of infinite power, wiſdom, and goodneſs, had remained totally inactive from all eternity, and had permitted the infinity of ſpace to continue a perfect vacuum, till within theſe 6000 years. Such narrow-minded ideas of the Almighty and his works, and ſuch forced conſtructions put upon particular texts by divines, tend to diſcredit the doctrines of revelation inſtead of ſerving it; and to render it contemptible in the eyes of thoſe, who have not leiſure or inclination to ſtudy its intrinſic merits. But thoſe who do, upon a ſtrict inveſtigation, will not only diſcover its peculiar internal beauties, but alſo that the whole ſyſtem, when freed from the falſe gloſſes of fallible men, contains nothing inconſiſtent with ſound philoſophy.—As to the nature of theſe beings, we are told, that they are ſpirits; but whether pure ſpirits diveſted of all matter, or united to ſome thin bodies, or corporeal vehicles, has been a controverſy of long ſtanding. Not only the ancient philoſophers, but ſome of the chriſtian fathers were of opinion, that angels were cloathed with etherial, or fiery bodies of the ſame nature with thoſe which we ſhall one day have when we come to be equal to them. But the more general opinion, eſpecially of later times has been, that they are ſubſtances entirely ſpiritual, though they can at any time aſſume bodies, and appear in human or other ſhapes. That the angelical powers and abilities vaſtly excel thoſe of man, cannot be denied, if we conſider, that their faculties are not clogged or impeded, as ours are, by any of thoſe imperfections which are inſeparable from corporeal beings: ſo that their underſtandings are always in perfect vigour; their inclinations regular; their motions ſtrong and quick; the actions irreſiſtible by material bodies, whoſe natural qualities they can control, or manage to their purpoſes, and occaſion either bleſſings or calamities, public or private, here below; inſtances of which are too numerous to mention. Beſides their attendance on God, and their executing his commands, they are alſo preſumed to be employed in taking care of mankind and their concerns; and that every man had ſuch a tutelar or guardian angel, from his birth, was a firm belief and tradition among the Jews; and our Saviour himſelf ſeems to have been of the ſame ſentiment. The heathens were likewiſe of the ſame opinion, and thought it a crime to neglect the admonitions of ſo divine a guide. Socrates publicly confeſſed himſelf to be under the direction of ſuch an angel, or dæmon, as ſeveral others have ſince done. And on this tutelar genius of each perſon they believed his happineſs and fortune depended. Every genius did his beſt for the intereſt of his client; and if a man came by the worſt, it was a ſign that the ſtrength of his genius was inferior to that of his opponent, that is, of an inferior order; and this was governed by chance. There were ſome genii, whoſe aſcendent was ſo great over others, that their very preſence entirely diſconcerted them; which was ſuppoſed to be the caſe of that of Auguſtus in reſpect of that of Marc Antony. The Romans thought the tutelar genii of thoſe who attained the empire, to be of an eminent order; on which account they had great honours ſhown them. The nations and cities alſo had their ſeveral genii. The ancient Perſians ſo firmly believed the miniſtry of angels, and their ſuperintendance over human affairs, that they gave their names to the months, and the days of their months, and aſſigned them diſtinct offices and provinces: and it is from them the Jews confeſs to have received the names of the months and angels, which they brought with them when they returned from the Babyloniſh captivity. After which we find, they alſo aſſigned charges to the angels, and in particular the patronage of empires and nations; Michael being the prince of the Jews, as Raphael is ſuppoſed to have been of the Perſians.—The Mahometans have ſo great a reſpect for the angels, that they account a man an infidel who either denies their exiſtence, or loves them not. They believe them to be free from ſin, enjoying the preſence of God, to whom they are never diſobedient: that they have ſubtile pure bodies, being created of light; and have no diſtinction of ſexes, nor need the refreſhment of food or ſleep. They ſuppoſe them to have different forms and offices: that ſome adore God in ſeveral poſtures; others ſing his praiſes, and intercede for men; ſome carry and encompaſs his throne; others write the actions of men, and are guardians to them.—Although the angels were originally created perfect, good and obedient to their Maſter's will, yet ſome of them ſinned, and kept not their firſt eſtate, but left their habitation; and ſo, of the moſt bleſſed and glorious, became the moſt vile and miſerable of all God's creatures. They were expelled the regions of light, and caſt down to hell, to be reſerved in everlaſting chains under darkneſs until the day of judgment. With heaven they loſt their heavenly diſpoſition, which delighted once in doing good and praiſing God; and fell into a ſettled rancour againſt him, and malice againſt men: their inward peace was gone; all deſire of doing good departed from them; and, inſtead thereof, revengeful thoughts and deſpair took poſſeſſion of them, and created an eternal hell within them. But for what offence, theſe apoſtate ſpirits fell from heaven, and plunged themſelves into ſuch an abyſs of wickedneſs and wo, are queſtions impoſſible to be determined by any clear evidence of Scripture. As to the time, we are certain that it could not be before the ſixth day of the creation; becauſe on that day it is ſaid, "God ſaw every thing that he had made, and behold it was very good:" but that it was not long after is very probable, as it muſt have preceded the fall of our firſt parents. Some have imagined it to have been after, and that carnality, or luſting to converſe with women upon earth, was the ſin which ruined them: but this is too ridiculous to bear refutation. Others have ſuppoſed, that the angels, being informed of God's intention to create man after his own image, and dignify his nature by Chriſt's aſſuming of it, and thinking their glory to be eclipſed thereby, envied man's happineſs, and ſo revolted; and with this opinion that of the Mahometans has ſome affinity; who are taught, that the devil, who was once one of thoſe angels who are neareſt to God's preſence, and named *Azazil*, forfeited paradiſe for refuſing to pay homage to Adam at the command of God. But on what occaſion ſoever it firſt ſhewed itſelf, pride ſeems to have been the leading ſin of the angels; who, admiring and valuing themſelves too much on the excellence of their nature, came at length to entertain ſo little reſpect for their Creator, as to be guilty of downright rebellion and apoſtacy. It is certain from Scripture, that theſe fallen angels were in great numbers, and that their conſtant employment is not only doing evil themſelves, but endeavouring by all arts to ſeduce and pervert mankind, by tempting them to all kind of ſin, and thereby bringing them into the ſame deſperate ſtate with themſelves.

ANGEL FISH, in ichthyology, a ſpecies of ſqualus. See SQUALUS.

ANGELIC. See ANGELICAL.

ANGELICA, *n. s.* the name of a plant. It is a genus of the digynia order, belonging to the pentandria claſs, and in the natural method ranking under the 45th order, Umbellatæ. The eſſential characters are: The fruit is roundiſh, angled, ſolid, with reflected ſtyli; the corolla are equal, and the petals incurvated. There are ſeveral ſpecies, the moſt remarkable of which are, 1. Arch Angelica, a native of Germany and Hungary. 2. The Atro Purpurea, and 3. the Lucida, both of which are natives of North America, and have the additional epithet of *Canadenſis*, from their abounding in Canada. 4. The Saliva, or common angelica, which is cultivated in gardens for medical uſe, and likewiſe for a ſweetmeat. The root of this ſpecies is brown, oblong, and an inch or two thick, fragrant, and acrid. The leaves are very large, compoſed of pinnated foliola, of an oblong oval figure, dentated at the edge, and the odd leaf at the end of the pinna lobated; the ſtalk is round, ſtriated, and as thick as a child's arm. The umbels are very large, and of a globoſe figure; the flowers are ſmall and greeniſh.—This ſpecies grows in a moiſt ſoil: the ſeeds ſhould be ſown ſoon after they are ripe. When the plants come up about ſix inches high, they ſhould be tranſplanted very wide, as their leaves ſpread greatly. If they are planted on the ſides of ditches or pools of water, about three feet diſtance, they will thrive exceedingly. The angelica is one of the moſt elegant aromatics, though little regarded in the preſent practice of medicine. The root, which is the moſt efficacious part, is uſed in the aromatic tincture; and the ſtalks make an agreeable ſweetmeat.

Angelica, wild. See Ægopodium.

ANGELICAL, *adj.* 1. Reſembling angels.—2. Partaking of the nature of angels.—3. Belonging to angels; ſuiting the nature or dignity of angels.

ANGELICALNESS, *n. s.* the quality of being angelical; reſemblance of angels; excellence more than human.

ANGELINA zanoni acostæ, in botany. This is a tree of vaſt ſize, ſometimes above 16 feet thick, growing on rocky and ſandy places in Malabar, in the Eaſt Indies. It bears ripe fruit in December, and continues bearing for a whole century. The dried leaves heated, are ſaid to alleviate pains and ſtiffneſs in the joints, and diſcuſs an intumeſcence of the teſtes, occaſioned by a contuſion, or any external violence; as alſo an *hydrocele*, or *pneumatocele*. It is efficacious likewiſe in venereal complaints and hæmorrhoidal fluxes.

ANGELO, St. the name of ſeveral places in Italy; particular of a ſtrong caſtle at Rome, to which the Pope retires in times of danger.

ANGELOLATRIA, *n. s.* the worſhip, or adoration of angels.

ANGELOLOGY, *n. s.* the doctrine of angels, their nature, office, &c.

ANGELOS, los, a province of Mexico, the ancient republic of Tlaſcala, of which a city called *Tlascala* was once the capital. That city is now reduced to an inconſiderable village, and has given place to another called *Peubla des los Angelos*, or the city of Angels. See next article.

Angelos, los, the ſecond city of Mexico, was formerly an Indian town; but in 1530 was entirely abandoned by the natives, on account of the cruelties of the Spaniards. A ſucceeding viceroy of Mexico, by a milder treatment, recalled them; and the town is now exceedingly rich and populous ſo as even to vie with Mexico itſelf in magnificence. It is ſituated on the river Zacatula, in a fine valley, about 25 leagues to the eaſtward of Mexico. In the middle is a beautiful and ſpacious ſquare, from whence run the principal ſtreets in direct lines, which are croſſed by others at right angles. One ſide is almoſt entirely occupied by the magnificent front of the cathedral; while the other three conſiſt of piazzas, under which are the ſhops of tradeſmen. The city is the ſee of a biſhop, and the revenue of the cathedral and chapter, amounts to 300,000 pieces of eight annually. Long. 28. 10. W. Lat. 19. 5. N.

ANGELOT, *n. s.* a muſical inſtrument, ſomewhat reſembling a lute.

ANGER, *n. s.* 1. uneaſineſs or diſcompoſure of the mind, upon the receipt of any injury.—2. Pain, or ſmart, of a ſore or ſwelling.

To Anger, *v. a.* 1. To make angry; to provoke; to enrage.—2. To make painful.

ANGERLY, *adv.* in an angry manner; like one offended; it is now written *angrily*.

ANGERS, an ancient city of France, in the department of Maine and Loire, ſituated near the confluence of the Sarte, the Loire and Maine, 45 miles Eaſt of Nantz. This laſt river divides the city into two equal parts. There are 12 pariſhes in it, and four in the ſuburbs, which contain upwards of 9000 houſes, and 36,000 inhabitants. Its greateſt extent is along the declivity of a hill, which reaches down to the river ſide.—The caſtle was built by St. Louis, about the middle of the 13th century. The walls, foſſes, and numerous towers which yet ſubſiſt, evinces its former magnificence; and its ſituation in the centre of the city, on a rock overhanging the river, gives it an air of grandeur. It was formerly the principal reſidence of the kings of Sicily, as dukes of Anjou. The cathedral is a venerable ſtructure. There are two large bridges, which keep up a communication between the two parts of the city; and in the leſſer of theſe there is another ſquare, which ſerves for a market. The univerſity of Angers was founded in 1398, and the academy of Belles Lettres in 1685. This laſt conſiſts of 30 academicians. At the end of the ſuburbs of Breſigny are the quarries of Angiers, famous for fine ſlates, *of the thickneſs* of a crown piece, and a foot ſquare. All the houſes in Angers are covered with this ſlate, which has gained it the appellation of the *Black City*. The walls, with which king John of England ſurrounded it in 1214, remain nearly entire, and are of a very great circumference. It is 50 miles E. of Nantz, and 175 S. W. of Paris. Long. 74. 30. E. Lat. 47. 28. N.

ANGINA, in medicine, a violent inflammation of the throat, otherwiſe called *quinzy*. See Medicine.

Angina gangrenosa, or *aquoſa*, the ulcerated, malignant, putrid ſore throat; on which there are various treatiſes by Fothergil, Huxham, Northcoat, &c.

ANGIOGRAPHY, *n. s.* a deſcription of veſſels in the human body; nerves, veins, arteries, and lymphatics.

ANGIOLOGY, *n. s.* a treatiſe or diſcourſe of the veſſels of the human body.

ANGIOMONOSPERMOUS, *adj.* ſuch plants as have but one ſingle ſeed in the ſeed-pod.

ANGIOSPERMIA, in the Linnæan ſyſtem of botany, the ſecond order in the claſs Didynamia. It conſiſts of thoſe plants, of that claſs whoſe ſeeds are incloſed in a pericarpium. In this order the ſtigma is generally obtuſe. Theſe are the perſonati of Tournfort.

ANGIOTOMY, *n. s.* a cutting open of the veſſels, as in the opening of a vein or artery.

ANGLE, *n. s.* the ſpace intercepted between two lines interſecting or meeting, ſo as, if continuing, they would interſect each other. The term angle is otherwiſe defined the inclination of two lines meeting one another in a point. See GEOMETRY.

ANGLE, *n. s.* an inſtrument to take fiſh, conſiſting of a rod, a line, and a hook.

To **ANGLE,** *v. n.* 1. To fiſh with a rod and hood.—2. To try to gain by ſome inſinuating artifices, as fiſhes are caught by a bait.

ANGLE ROD, *n. s.* the ſtick to which the line and hook are hung.

ANGLER, *n. s.* he who fiſhes with an angle.

ANGLESEY, ISLE OF, the moſt weſtern county of North Wales. It is ſeparated from Caernarvonſhire by a ſtrait called *Menai*, which in ſome places may be paſſed on foot at low water. The antient name of this iſland was *Mona* or *Moneg*. The Welſh, or ancient Britons, called it the *land of Man;* but, on its being conquered by the Engliſh in the reign of Edward I. it was changed to Angleſey, which ſignifies iſland. It was the great nurſery of the religion of the ancient Druids, and the chief reſidence of their pontiff. Rude mounds and heaps of ſtones, ſaid to be druidical remains, are ſtill to be ſeen in great numbers. It is ſo remarkable for its fertility, when compared with other places of this principality, that the Welſh, even to this day, call it, by way of eminence, "Mam Cymry," that is, the nurſing mother of Wales. At *Parys* mountain, on this iſland, is the moſt conſiderable body of copper ore, perhaps ever known. The mountain has a rude miſhapen appearance, ſtarting up into huge rocks of coarſe white quartz; but the chief peculiarity of this mine is, that the ore, inſtead of forming ſtrata, conſtitutes the whole maſs of the rock—But nature has been profuſe in beſtowing her mineral favours on this ſpot; for above the copper ore, and not more than three quarters of a yard beneath the common ſoil, is a bed of yellowiſh greaſy clay, from one to four yards thick, containing lead ore, and yielding from 600 to 1000 pounds of lead from one ton; and one ton of the metal yields not leſs than 57 ounces of ſilver. The works neceſſary for extracting theſe ores, &c. have added greatly to the population of the iſland; for about 1500 perſons are employed, who, with their families are ſuppoſed to make nearly 8000 perſons, all of whom get their living from the mines. Near Themlyn bay is a quarry of marble, common to this place, ſome parts of Italy, and to Corſica, and commonly known by the name of *Verde di Corſica*. Its colours are green, black, white, and dull purple, regularly diſpoſed. The iſland of Angleſey is about 24 miles in length and 18 in breadth; and is ſuppoſed to contain about twenty-three thouſand inhabitants. Its chief town is Beaumares. Lat. 53. 15. N. Long. 70. 58. E.

ANGLICISM, *n. s.* an Engliſh idiom.

ANGLING, among ſportſmen, the art of fiſhing with a rod, to which are fitted a line, hook, and bait. See FISHING-ROD, FISHING-HOOK, FISHING-FLY.

ANGLO-SAXON, an appellation given to the language ſpoken by the Engliſh Saxons; in contradiſtinction from true Saxon, as well as modern Engliſh.

ANGOLA, is a kingdom on the weſtern coaſt of Africa, lying according to the moſt probable accounts between 5 and 16 ſouth lat. and 85 and 90 eaſt long. Though this country is called Angola by Europeans, amongſt the natives it has the name of *Dombo*. It is bounded on the north by Congo proper; on the eaſt by Maiemba, on the ſouth by Benguela, and on the weſt by the ocean. The ſoil is fertile, producing Indian corn, beans, oranges, lemons, and ſeveral other fruits; and is rich in mines of ſilver, copper and other metals. The people are divided into four claſſes, the firſt of which are noblemen; the ſecond are ſtyled children of the dominion, and are for the moſt part artificers and huſbandmen; the third are the ſlaves of the ſeveral lords, and are conſidered as part of their property; and the fourth are ſlaves taken in war. The trade of the Portugueſe and other Europeans in Angola conſiſts chiefly in the inhuman traffic of ſlaves. Theſe are bought about one hundred and fifty or two hundred miles up the country, and thence ſent down to the coaſt. All ſorts of commodities are brought thither by theſe man traders, particularly cloth, kerſeys, ticking, linen, gold and ſilver lace, knives, brandy, &c. The Angolans are univerſally allowed to be tall, elegant and handſome in their perſons, but the diſpoſition of their minds is variouſly repreſented by various authors. Thoſe who view them only in a ſtate of captivity, repreſent them as the moſt obſtinate, lazy, and untractable of all the ſlaves purchaſed on the coaſt of Africa. But thoſe who have viewed them in a free ſtate on their native ſoil, ſpeak of them as an amiable, peaceable, and hoſpitable people, who, from the fertility of their ſoil, and ſimplicity of their manners, live very much at their eaſe. It is doubtleſs owing to theſe circumſtances, that they diſplay ſuch a difference of character in theſe oppoſite ſituations; and that theſe injured people, when carried into captivity, ſhew an independency of ſpirit and impatience of fatigue and control, much ſuperior to the natives of the Gold coaſt; where the ſoil being barren, the inhabitants are more accuſtomed to labour and hardſhips. The manner, religion, dreſs, &c. of the Angolans are much the ſame with thoſe of the Congoeſe. See CONGO. The chief town of Angola, and one of the moſt conſiderable belonging to the Portugueſe ſettlements in Africa, is named St. Paul de Loando, which ſtands in 8. 45. S. Lat. and contains about three thouſand houſes built of ſtone, and covered with tiles, beſides a vaſt number of negroes huts made of ſtraw and earth. But although the Portugueſe preſerve their ſuperiority in Angola, yet the Engliſh, Dutch and other European nations carry on trade with the natives for various commodities, but chiefly for ſlaves.

ANGOUR, *n. s.* pain.

ANGOURA, or ANGYRA, anciently ANCYRA, a town of Natolia, in Aſiatic Turkey, remarkable for its remains of antiquity; ſuch as inſcriptions, pillars, ruins of temples, &c. It is at preſent one of the beſt cities in Anatolia, and is computed to have 100,000 inhabitants, 90,000 of whom are Turks. Greeks, Armenians, &c. compoſe the remaining 10,000. The Armenians have ſeven churches, beſides a monaſtery; and the Greeks two. The country produces very good red wine, and excellent rice grows on the banks of ſome of the rivers. In this place, there is the fineſt breed of goats in the world; their hair or wool is a pure dazzling white, about nine inches long, and almoſt as fine as ſilk; a great trade is carried on in this article, and the fineſt ſtuffs, eſpecially camblets, are made of it. All the inhabitants are employed in this manufacture. The exports of Angoura, to Holland, France, and Great-Britain, are about 1600 camels load yearly. Angoura is ſituated 212 miles S. E. of Conſtantinople. Several large caravans paſs through this city to different places. Long, 107. 5. E. Lat. 39. 30. N.

ANGOY, a ſmall kingdon of Loango in Africa, bounded on the N. by Cacongo, and on the S. by Congo; from the former of which it is ſeparated by the Cabinda, and from the latter by the river Zaire. This country is full of woods and thickets; and has no town of any note, except one called Bomangoy, ſituated on the north banks of the Zaire, and not far from its mouth. Its chief port is Cabinda, ſituated on the mouth of a river of the ſame name about five leagues N. of Cape Palmerino, on the N. ſide of the Zaire's mouth. The bay is very commodious for trade, or wooding and watering along the ſhore; and the Engliſh have a factory on the ſouthweſt of the road. The dreſs of the inhabitants is the ſame with that of the Congoeſe. They allow polygamy, and the beſt beloved wife hath the command of the reſt; but is no leſs liable to be turned out, if ſhe prove unfaithful. The ladies of the blood royal, however, have the privilege of chooſing their huſbands out of any, even of the meaneſt rank; and have even the power of life and death over them; but the huſbands are by no means intitled to expect the ſame fidelity from their royal ſpouſes. Their religion conſiſts chiefly in a variety of ſuperſtitious cuſtoms; ſuch as powdering their public and domeſtic idols with the duſt of a kind of red wood, on the firſt day of the moon, and paying a kind of worſhip to that planet. We do not hear of their offering any ſacrifices to their idols; though they commonly conſult them about the ſucceſs of their enterpriſes, thefts, or the like. The country round the bay is moſtly barren; owing chiefly to the lazineſs of the inhabitants, which often occaſions a ſcarcity of proviſions. The wild beaſts are ſo numerous in the woods, that they deſtroy all the tame kinds; there are therefore no cattle bred in it but hogs. From the woods in this country ſome monkeys have been brought, which in ſhape and ſtature reſemble the human ſpecies. The coaſts abound greatly with oyſters, which are found lying in heaps like ſmall rocks. The natives chiefly follow the occupation of fiſhing, on the ſea and in the rivers, making uſe of drag nets, which have long canes fixed at equal diſtances, inſtead of corks, to ſhew when any fiſh are caught. Theſe nets are made of a peculiar kind of root, which, after being beaten, may be ſpun like hemp.

ANGRA, a city of Tercera, one of the Azores; the capital, not only of that iſland, but of all the reſt, and the reſidence of the governor. The harbour is the only tolerable one in the whole iſland, and is of the form of a creſcent; the extremities of which are defended by two high rocks, that run ſo far into the ſea as to render the entrance narrow, and eaſily covered by the batteries on each ſide. From this harbour the town is ſaid to derive its name, the word *Angra* ſignifying a creek, bay, or ſtation for ſhipping. The town is well built and populous, and is the ſee of a biſhop. It is ſurrounded by a good wall, a dry ditch of great depth and breadth, and defended by a caſtle. The Engliſh, French and Dutch, have each a conſul reſiding here, though the commerce of any of theſe nations with the Azores is very inconſiderable, being only for wood, corn, and other proviſions. Long. 47. 63. E. Lat. 38. 39. N.

ANGRILY, *adv.* in an angry manner; furiouſly; peeviſhly.

ANDROGNA, or ANGROGNE, a mountainous but fertile diſtrict of Piedmont, acceſſible only at two places from the S. and. E. and memorable for affording ſeveral ſafe retreats to thoſe zealous friends of religious truth and liberty, the Waldenſes and Albigenſes; who ſtood out againſt the power of the Roman pontiff, many centuries before the reformation. The caves under the rocks, afforded a ſafe aſylum, both to the people and their paſtors, who preached to them in theſe caverns, without interruption from their perſecutors.

ANGRY, *adj.* 1. Touched with anger; provoked.—2. Having the appearance of anger.—3. Painful; inflamed; ſmarting.

ANGUILLA, the moſt northerly of the Caribbee iſlands; it has its name from its ſnake like form; and is about ten leagues in length, and three in breadth. It was firſt diſcovered by the Engliſh in 1650, when it was filled with alligators and other noxious animals; but finding the ſoil fruitful, and proper for raiſing tobacco and corn, they ſettled a colony in it, and imported live cattle, which have ſince multiplied exceedingly. The inhabitants ſubſiſt moſtly by farming: though they ſtill plant ſome ſugar, and the iſland is ſaid to be capable of great improvements. It lies in the Atlantic Ocean, 100 miles N. of St. Chriſtopher's. Long. 11. 50. E. Lat. 18. 15. N.

ANGUILLIFORMES, in ichthyology, a very large claſs of fiſhes, which are ſoft and lubricous like the eel, and have no ſcales. Moſt of the fiſh compriſed in this claſs, are long bodied alſo like the eel. Some of them have neither fins at their gills nor belly, as the *murænæ* and *lampetræ*; others have fins at their gills, but none on their bellies, as the ſea ſerpent, eel, conger, ophidion, and ammodytes. And others have both, as the tæniæ, muſtelæ, alaudæ, and the like. The word is alſo applied to ſome kinds of worms.

ANGUINEAL HYPERBOLA. See HYPERBOLA and CURVE.

ANGUINUM OVUM, the *adder stone*, a fabulous kind of egg, ſaid to be produced by the ſaliva of a cluſter of ſerpents, and poſſeſſed of certain magical virtues. The ſuperſtition in reſpect to theſe, was very prevalent among the ancient Britons, and there ſtill remains a ſtrong tradition of it in Wales. Pliny gives a ſimilar account of it, lib. xix. cap. 3. This wondrous egg ſeems to have been nothing more than a bead of glaſs, uſed by the Druids, as a charm to impoſe on the vulgar; whom they taught to believe, that the poſſeſſor would be fortunate in all his attempts, and that it would gain him the favour of the great. Our modern Druideſſes, ſays Mr. Pennant, give much the ſame account of the ovum anguinum, (*glain neidr*, as the Welſh call it, or the adder-gem,) as the Roman philoſopher does; but ſeem not to have ſo exalted an opinion of its power, uſing it only to aſſiſt children in cutting their teeth, or to cure the chincough, or to drive away an ague. Theſe beads are of a very rich blue colour; ſome plain, others ſtreaked. For their figure, ſee Pl. XI. fig. 22. No. 1, 2, 3.

ANGUIS, or Snake, in zoology, a genus belonging to the order of amphibia ſerpentes. The character of the anguis are theſe: They are ſquamous and ſcaly in the belly, and under the tail; without any ſcuta. See Plate XI.—There are 15 ſpecies, one of which, ſays Linnæus, are poiſonous.

1. The Bipes, or two footed ſnake, is a native of the Indies; it has two ſhort feet, with two toes, near the anus. In every ſcale of this ſpecies, there is a brown point.

2. The Cerastes, with 200 ſquamæ on the belly, and 15 on the tail, is a native of Egypt.

3. The Colubrina, an inhabitant of Egypt, is beautifully variegated, with pale and yellow colours.

4. The Eryx, a native of America and Britain, is about a ſpan in length, and about the thickneſs of a man's finger.

5. The Fragilis, or glaſs ſnake of Cateſby, has 129 ſquamæ on the belly, and 223 on the tail. The head is very ſmall, and the tongue of a ſimilar form. The upper part of the body is of a colour blended brown and green, moſt regularly and elegantly ſpotted with yellow, the undermoſt part of which is brighteſt. The ſkin is very ſmooth; and ſhining with ſmall ſcales, more cloſely connected, and of a different ſtructure from that of other ſerpents. A ſmall blow with a ſtick will cauſe the body to ſeparate, not only at the place ſtruck, but at two or three other places, the muſcles being articulated in a particular manner quite thro' to the vertebra. They appear earlier in the ſpring than any other ſerpent, and are numerous in the ſandy woods of Virginia and Carolina. They are generally ſaid to be harmleſs.

6. The Iaculus, or dart ſnake, is about three handbreadths long, and about the thickneſs of one's little finger. Its colour is a milky grey on the back, variegated with ſmall black ſpots, like ſo many eyes; and on the belly it is perfectly white. The neck is wholly black; and from that, two milk-white ſtreaks run all the way along the back to the tail; the black ſpots alſo are each ſurrounded with a ſmall circle of white. It has its name from its vibrating its body in the manner of a dart. It is a native of Egypt, Lybia, and the iſlands of the Mediterranean.

7. The Laticauda, a native of Surinam; the tail is compreſſed, acute, and pale, with browniſh belts.

8. The Lumbricalis, a native of America, has 230 ſquamæ on the belly, and 7 on the tail; its colour is a yellowiſh white.

9. The Maculata, a native of America, is yellow, and interſperſed with aſh coloured lines on the back; the head is ſmall in proportion to the body. See Pl. X. Fig. 5.

10. The Meleagris, is a native of the Indies; it has ſmall teeth, but no ears. This ſpecies has a great reſemblance to the former.

11. The Platura: The head is oblong and without teeth; the body is about a foot and a half long, black above and white below; the tail is about one-ninth of the length of the animal, much compreſſed or flatted, and variegated with black and white; the ſcales are roundiſh, ſmall, not imbricated, but they connot be numbered.

12. The quadrupedis, or four-footed ſnake. The body of this ſpecies is cylindrical, with 14 or 15 longitudinal aſh-coloured ſtreaks; the teeth are extremely ſmall; it has no ears: the feet are at a great diſtance from each other, very ſhort, with five toes and ſmall nails; but the toes are ſo minute, that they can hardly be numbered: It is a native of Java.

13. The Reticulata, a native of America, has browniſh ſcales, with a white margin.

14. The Scytale, a native of the Indies, with 220 ſquamæ on the belly, and 13 on the tail. The head is ſmall and oval, and the eyes are little; the body is cylindrical, about a foot and a half long, covered with oval obtuſe ſcales; the tail is thick and obtuſe like the head; its colour is white, interſperſed with browniſh rings; the margins of the ſcales are of an iron colour; and the top of the head is blue.

15. The Ventralis, blind worm, or ſlow worm, grows to about a foot in length, and to the thickneſs of a man's little finger: the irides are red; the head is ſmall; the neck ſtill more ſlender; from that part the body grows ſuddenly, and continues of an equal bulk to the tail, which ends quite blunt. The colour of the back is cinerous, marked with very ſmall lines, compoſed of minute black ſpecks: the ſides are of a reddiſh caſt; the belly duſky: both marked like the back. The tongue is broad and forky; the teeth are minute, but numerous; the ſcales ſmall. The motion of this ſerpent is ſlow, from which, and from the ſmallneſs of the eyes, are derived its Engliſh names. It reſembles the viper, in the manner of producing its young, which are put forth alive. Like others of the genus, they lie torpid during winter, and are ſometimes found in vaſt quantities twiſted together.

Anguis æsculapii. See Coluber.

ANGUISH, *n. s.* exceſſive pain either of mind or body.

ANGULAR. *adj.* having angles or corners; cornered.

ANGULARITY, *n. s.* the quality of being angular, or having corners

ANGULARLY, *adv.* with angles or corners.

ANGULATED, *adj.* formed with angles or corners.

ANGULOSITY, *n. s.* angularity.

ANGULOUS, *adj.* hooked; angular.

ANGURIA, the water-melon: a genus of the diandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 34th order, Cucurbitaceæ. The eſſential characters are theſe: The male calyx is quinqaefid, and the corolla quinquepetalous: The female calyx and corolla the ſame: The pericarpium is a dome beneath, with two cells: The ſeeds are numerous. Of this genus, Linnæus reckons three ſpecies, viz.

1. The Pedata,
2. The Trifoliata, and
3. The Trilobata.

This fruit is cultivated in Spain, Portugal, Italy, and other warm countries of Europe; as alſo in Africa, Aſia, and America; where it is eſteemed on account of its wholeſome cooling quality.

ANGUST, *adj.* narrow; ſtrait.

ANGUSTATION, *n. s.* the act of making narrow; ſtraitening; the ſtate of being narrowed.

ANHELATION, *n. s.* the act of panting; the ſtate of being out of breath.

ANIAN, a barren, ſandy deſart, lying on the Eaſt coaſt of Africa, and extending from the 5th to the 12th degree N. Lat. It is ſo exceſſively hot, and otherwiſe inhoſpitable, that it contains but very few inhabitants, except ſome wandering Arabs, who live in camps.

ANJENGO, a ſmall town and factory, with a fort, on the coaſt of Malabar, in the peninſula on this ſide the Ganges, belonging to the Britiſh Eaſt-India Company. This ſettlement ſupplies the Company with pepper and calicoes; its ſituation is alſo very convenient, for giving proper intelligence to the ſhips touching here from Europe, or from any part of India. Lon. 152. E. Lat. 7. 0. N.

ANIGHTS, *adv.* in the night time.

ANIL, *n. s.* the ſhrub from whoſe leaves and ſtalks indigo is prepared.

ANIL, or NIL, in botany, a ſynonime of a ſpecies of indigofera. See INDIGOFERA.

ANILENESS, ANILITY, } The ſtate of being an old woman.

ANIMA, among divines and naturaliſts, denotes the ſoul, or principle of life, in animals. See SOUL.

ANIMA MUNDI, [*i. e.* the ſoul of the World,] a certain pure ethereal ſubſtance or ſpirit, diffuſed, according to many of the ancient philoſophers, through the maſs of the world, informing, actuating, and uniting the divers parts thereof into one great, perfect, organical, and vital body or animal. Plato treats at large of this ſoul of the world, in his *Timæus;* and is even ſuppoſed to be the author of the *dogma;* yet interpreters are much at a loſs about his meaning. Ariſtotle, however, taking it in the common and obvious ſenſe, ſtrenuouſly oppoſes it. The modern Platoniſts explain their maſter's *anima mundi* by a certain univerſal ethereal ſpirit, which in the heavens exiſts perfectly pure, as retaining its proper nature; but on earth pervading elementary bodies, and intimately mixing with all the minute atoms thereof, it aſſumes ſomewhat of their nature, and becomes of a peculiar kind. They add, that this *anima mundi*, which more immediately reſides in the celeſtial regions as its proper ſeat, moves and governs the heavens in ſuch a manner, as that the heavens themſelves firſt received their exiſtence from the fecundity of the ſame ſpirit: for that this *anima*, being the primary ſource of life, every where breathed a ſpirit like itſelf, by virtue whereof various kinds of things were framed conformable to the divine ideas.

ANIMABLE, *adj.* that which may be put into life, or receive animation.

ANIMADVERSION, *n. s.* 1. Reproof; ſevere cenſure; blame.—2. Puniſhment.—3. Animadverſion in literature, is uſed to ſignify, ſometimes correction, ſometimes remarks upon a book, &c. and ſometimes a ſerious conſideration upon any point.

To ANIMADVERT, *v. n.* 1. To paſs cenſures upon.—2. To inflict puniſhments.

ANIMADVERTER, *n. s.* he that paſſes cenſures, or inflicts puniſhments.

ANIMAL, *adj.* 1. That which belongs or relates to animals.—2. *Animal* is uſed in oppoſition to *ſpiritual*, or *rational;* as the *animal* nature.

ANIMAL, *n. s.* a living creature corporeal, diſtinct, on the one ſide, from pure ſpirit; on the other from mere matter.—To the above definition of an animal, we would add, as a ſtill more accurate and diſtinctive characteriſtic, that an animal is an organized living body, endued with ſenſation: for minerals are ſaid to grow or increaſe, plants to grow and live, but animals alone have ſenſation. It is this property alone that can be deemed the eſſential characteriſtic of an animal; and by which the animal and vegetable kingdoms ſeem to be ſo eſſentially ſeparated, that we cannot even imagine the leaſt approximation of the one to the other. Thoſe naturaliſts, indeed, who have ſuppoſed the diſtinction between animals to conſiſt in any thing elſe, have found themſelves greatly embarraſſed; and have generally agreed, that it was extremely difficult, if not impoſſible, to ſettle the boundaries between the animal and vegetable kingdoms. But this difficulty will be eaſily ſeen to ariſe from their taking the characteriſtic marks of the animal kingdom, from ſomething that was evidently common to both. Thus Boerhaave attempted to diſtinguiſh an animal from a vegetable, by the former having a mouth, which the latter has not: but here, as the mouth of an animal is only the inſtrument by which nouriſhment is conveyed to its body, it is evident that this can be no eſſential *diſtinction*, becauſe vegetables alſo require nouriſhment, and have inſtruments proper for conveying it into their bodies; and where the end is the ſame, a difference in the means can never be eſſential. The fixing the difference in the animals having a gula, ſtomach, and inteſtines, as is done by Dr. Tyſon, is as little to the purpoſe. No power, at firſt view, ſeems more diſtinctive between an animal and a vegetable than that of moving from one place to another. Many have thought this power ſufficient to conſtitute a difference, and indeed, in moſt caſes, it is the obvious mark by which we diſtinguiſh them. But Lord Kames hath given ſeveral very curious inſtances of the locomotive power of plants; ſome of which, as he ſays, would do honor to an animal.—"Upon the ſlighteſt touch, the ſenſitive plant ſhrinks back and folds up its leaves, ſimilar to a ſnail; which on the ſlighteſt touch retires within its ſhell. A new ſpecies of the ſenſitive plant hath been lately diſcovered." (See DIONÆA.) "If a fly perch upon one of its flower-leaves, it cloſes inſtantly, and cruſhes the inſect to death. There is not an article in botany more admirable than a contrivance, viſible in many plants, to take advantage of good weather, and to protect themſelves againſt bad. They open and cloſe their flowers and leaves in different circumſtances: ſome cloſe before ſunſet, ſome after: ſome open to receive rain, ſome cloſe to avoid it. The petals of many flowers expand in the ſun, but contract at night, or on the approach of rain. After the ſeeds are fecundated, the petals no longer contract. All the trefoils may ſerve as a barometer to the huſbandman; they always contract their leaves on an impending ſtorm. Some plants follow the ſun, others turn from it. Many plants, on the ſun's receſs, vary the poſition of their leaves, which is ſtyled the *ſleep of plants.* A ſingular plant was lately diſcovered in Bengal. Its leaves are in continual motion all day long; but when night approaches, they fall down from an erect poſture to reſt."—(See HEDYSARUM.) "A plant has a power of directing its roots for procuring food. The red whortle-berry, a low ever-green plant, grows naturally on the tops of high hills, among ſtones and gravel. This ſhrub was planted in an edging to a rich border, under a fruit-wall. In two or three years, it over-ran the adjoining deep-laid gravel-walk; and ſeemed to fly from the border, in which not a ſingle runner appeared. An effort to come at food in a bad ſituation, is extremely remarkable in the following inſtance. Among the ruins of Newabbey, formerly a monaſtery in Galloway, there grows on the top of a wall a plane tree about 20 feet high. Straitened for nouriſhment in that barren ſituation, it ſeveral years ago directed roots down the ſide of the wall, till they reached the ground ten feet below; and now the nouriſhment it afforded to thoſe roots during the time of their deſcending is amply repaid, having every year ſince that time made vigorous ſhoots. From the top of the wall to the ſurface of the earth, theſe roots have not thrown out a ſingle fibre; but are now united in a ſingle root. Plants, when forced from their natural poſition, are endued with a power to reſtore themſelves. A hop plant, twiſted round a ſtick, directs its courſe from S. to W. as the ſun does. Untwiſt it, and tie it in the oppoſite direction: it dies. Leave it looſe in the wrong direction: it recovers its natural direction in a ſingle night. Twiſt a branch of a tree ſo as to invert its leaves, and fix it in that poſition: if left in any degree looſe, it untwiſts itſelf gradually, till the leaves be reſtored to their natural poſition. What better can an animal do for its welfare? A root of a tree meeting with a ditch in its progreſs, is laid open to the air. What follows? It alters its courſe like a rational being, dips into the ground, ſurrounds the ditch, riſes on the oppoſite ſide to its wonted diſtance from the ſurface, and then proceeds in its original direction. Lay a wet ſponge near a root laid open to the air; the root will direct its courſe to the ſponge. Change the place of the ſponge; the root varies its direction.—Thruſt a pole into the ground at a moderate diſtance from a ſcandent plant: the plant directs its courſe to the pole, lays hold of it, and riſes on it to its natural height. A honyſuckle proceeds in its courſe, till it be too long for ſupporting its weight: and then ſtrengthens itſelf by ſhooting into a ſpiral. If it meet with another plant of the ſame kind, they coaleſce for mutual ſupport; the one ſcrewing to the right, the other to the left. If a honyſuckle twig meets with a dead branch, it ſcrews from the right to the left. The claſpers of briony ſhoot into a ſpiral, and lay hold of whatever comes in their way for ſupport. If, after completing a ſpiral of three rounds, they meet with nothing, they try again by altering their courſe." By comparing the above and other inſtances of ſeeming voluntary motion in plants, with that ſhare of life wherewith ſome of the inferior kinds of animals are endued, we can ſcarce heſitate at aſcribing the ſuperiority to the former; that is, putting ſenſation out of the queſtion. Muſcles, (a ſpecies of bivalve ſhell fiſh) for inſtance, are fixed to one place as much as plants are; nor have they any power of motion, beſides that of opening and ſhutting their ſhells: and in this reſpect they have no ſuperiority over the motion of the ſenſitive plant; nor doth their motion diſcover more ſagacity, or even ſo much as the root of the plane tree mentioned by Lord Kames. Buffon, who ſeems to be deſirous of confounding the animal and vegetable kingdoms, denies ſenſation to be any eſſential diſtinction. "Senſation (ſays he) more eſſentially diſtinguiſhes animals from vegetables: but ſenſation is a complex idea, and requires ſome explication. For if ſenſation implied no more than motion conſequent upon a ſtroke or an impulſe, the ſenſitive plant enjoys this power. But if, by ſenſation, we mean the faculty of perceiving and comparing ideas, it is uncertain whether brute animals are endowed with it. If it ſhould be allowed to dogs, elephants, &c. whoſe actions ſeem to proceed from motives ſimilar to thoſe by which men are actuated, it muſt be denied to many ſpecies of animals, particularly to thoſe which appear not to poſſeſs the faculty of progreſſive motion. If the ſenſation of an oyſter, for example, differed only in degree from that of a dog; why do we not aſcribe the ſame ſenſation to vegetables, though in a degree ſtill inferior? This diſtinction, therefore, between the animal and vegetable, is neither general nor determined. From this inveſtigation we are led to conclude, that there is no abſolute and eſſential diſtinction between the animal and vegetable kingdoms; but that nature proceeds, by imperceptible degrees, from the moſt perfect to the moſt imperfect animal, and from that to the vegetables; and the freſh water polypus may be regarded as the laſt of animals, and the firſt of plants." It were to be wiſhed, that philoſophers would on ſome occaſions conſider, that a ſubject may be dark as well on account of their inability to ſee, as when it really affords no light. The Count boldly concludes, that there is no eſſential difference between a plant and an animal, becauſe we aſcribe ſenſation to an oyſter, and none to the ſenſitive plant; but we ought to remember, that though we cannot perceive a diſtinction, it may nevertheleſs exiſt. Before Buffon, therefore, had concluded in this manner, he ought to have proved that ſome vegetables were endowed with ſenſation. It is no doubt, however, as much incumbent on thoſe who take the contrary ſide of the queſtion, to prove that vegetables are not endowed with ſenſation, as it was incumbent on M. Buffon to have proved that they are.—But a little attention will ſhow us, that the difficulty here proceeds entirely from our inability to ſee the principle of ſenſation. We perceive this principle in ourſelves, but no man can perceive it in another. Why then does every individual of mankind conclude that his neighbour has the ſame ſenſations with himſelf? It can only be from analogy.—Every man perceives his neighbour formed in a manner ſimilar to himſelf; he acts in a ſimilar manner on ſimilar occaſions, &c. Juſt ſo it is with brute animals. It is no more doubtful that they have ſenſations, than that we have them ourſelves. If a man is wounded with a knife, for inſtance, he expreſſes a ſenſe of pain, and endeavours to avoid a repetition of the injury. Wound a dog in the ſame manner, he will alſo expreſs a ſenſe of pain; and, if you offer to ſtrike him again, will endeavour to eſcape before he feels the ſtroke. To conclude here, that the action of the dog proceeded from a principle different from that of the man, would be abſurd and unphiloſophical to the laſt degree.—We muſt further take notice, that there are ſenſations eſſentially diſtinct from one another; and in proportion as an animal is endowed with more or fewer of theſe different ſpecies, it is more or leſs perfect as an animal: but, as long as one of them remains, it makes not the leaſt approach to the vegetable kingdom; and, when they are all taken away, is ſo far from becoming a vegetable, that it is only a maſs of dead matter. The ſenſes of a perfect animal, for inſtance, are five in number. Take away one of them, ſuppoſe ſight; he becomes then a leſs perfect animal, but is as unlike a vegetable as before. Suppoſe him next deprived of hearing; his reſemblance to a vegetable would be as little as before; becauſe a vegetable can neither feel, taſte, nor ſmell, and we ſuppoſe him ſtill to enjoy theſe three ſenſes. Let us, laſtly, ſuppoſe him only endowed with the ſenſe of feeling, which, however, ſeems to include that of taſte, and he is no more a vegetable than formerly, but only an imperfect animal. If this ſenſe is then taken away, we connect him not with the vegetable kingdom, but with what Buffon calls *brute matter*. It is to this kingdom, and not to the vegetable, that animals plainly approximate as they deſcend. Indeed, to ſuppoſe an approximation between the vegetable and animal kingdoms, is very abſurd: for, at that rate, the moſt imperfect animal ought to be the moſt perfect plant; but we obſerve no ſuch thing. All animals, from the higheſt to the loweſt, are poſſeſſed of vegetable life; and that, as far as we can perceive, in an equal degree, whether the animal life is perfect or imperfect: nor doth there ſeem to be the ſmalleſt connection between the higheſt degree of vegetation and the loweſt degree of ſenſation. Though all animals, therefore, are poſſeſſed of vegetable life, theſe two ſeem to be as perfectly diſtinct and incommenſurate one to another, as any two things we can poſſibly imagine.

The power of vegetation is as perfect in an onion or leek, as in a dog, an elephant, or a man: and yet, though you threaten a leek or an onion ever ſo much, it pays no regard to your words, as a dog would do; nor, though you wound it, does it avoid a ſecond ſtroke. It is this principle of ſelf-preſervation in all animals, which, being the moſt powerful one in their nature, is generally taken, and with very good reaſon, as the true characteriſtic of animal life. This principle is undoubtedly a conſequence of ſenſation; and as it is never obſerved to take place in vegetables, we have a right to ſay that the foundation of it, namely ſenſation, belongs not to them. There is no animal, which makes any motion in conſequence of external impulſe where danger is threatened, but what puts itſelf in a poſture of defence; but no vegetable whatever does ſo. A muſcle, when it is touched, immediately ſhuts its ſhell; and as this action puts it in a ſtate of defence, we conclude that it proceeded from the principle of ſelf-preſervation. When the ſenſitive plant contracts from a touch, it is no more in a ſtate of defence than before; for whatever would have deſtroyed it in its expanded ſtate, will alſo do it in its contracted ſtate. We conclude, therefore, that the motion of the ſenſitive plant proceeds only from a certain property called by phyſicians *irritability*; and which, though our bodies poſſeſs it in an eminent degree, is a characteriſtic of neither animal nor vegetable life, but belongs to us in common with brute matter. It is certain, that an electrified ſilk thread throws a much greater variety of motions than any ſenſitive plant. If a bit of ſilk thread is dropt on an electrified metal plate, it immediately erects itſelf; ſpreads out the ſmall fibres like arms; and, if not detained, will fly off. If a finger is brought near it, the thread ſeems greedily to catch at it. If a candle approaches, it claps cloſe to the plate, as if afraid of it.—Why do we not conclude that the thread in this caſe is really afraid of the candle? For this plain reaſon, That its ſeeming fright is not to get away from the candle, but to get towards the electrified metal; and, if allowed to remain there, it will ſuffer itſelf to be burnt without offering to ſtir.—The ſenſitive plant, in like manner, after it has contracted, will ſuffer itſelf to be cut in pieces without making the leaſt effort to eſcape. The caſe is not ſo with the meaneſt animal. An hedge-hog, when alarmed, draws its body together, and expands its prickles, thereby putting itſelf in a poſture of defence. Throw it into water; and the ſame principle of ſelf-preſervation prompts it to expand its body and ſwim. A ſnail, when touched, withdraws itſelf into its ſhell; but if a little quicklime is ſprinkled upon it, ſo that its ſhell is no longer a place of ſafety, it is thrown into agonies, and endeavours to avail itſelf of its locomotive power in order to eſcape the danger. In muſcles and oyſters, indeed, we cannot obſerve this principle of ſelf-preſervation ſo ſtrongly, as nature has deprived them of the power of progreſſive motion: but, as we obſerve them conſtantly to uſe the means which nature has given them for ſelf-preſervation, we can have no reaſon to think that they are deſtitute of that principle upon which it is founded. After all that has been ſaid on this ſubject, there is no need of arguments drawn from the inferior creation. We ourſelves are poſſeſſed both of the animal and vegetable life, and certainly know whether there is any connection between vegetation and ſenſation or not.—We are conſcious that we exiſt; that we hear, ſee, &c. but of our vegetation we are abſolutely inconſcious. We feel a pleaſure, for inſtance, in gratifying the calls of hunger and thirſt; but of the proceſs by which our aliment is formed into chyle, the chyle mixed with the blood, the circulation of that fluid, and the ſeparation of all the humours from it, we are altogether ignorant. If we then, who are more perfect than other vegetables, are utterly inſenſible of our own vegetable life, why ſhould we imagine that the leſs perfect vegetables are ſenſible of it? To illuſtrate our reaſoning here by an example?—The direction of the roots of the plane tree mentioned by Lord Kames, ſhows as much ſagacity, if we are to look only to the outward action, as can be obſerved in any motion of the moſt perfect animal whatever; nevertheleſs, we have not the leaſt ſuſpicion, either that the tree ſaw the ground at a diſtance, or that it was informed of its being there by the reſt of its roots. If a wound is made in the body of a man, and a loſs of ſubſtance is to be repaired, the ſame ſagacity will be obſerved in the arrangement of the fibres, not only as if they were animated, but they will diſpoſe of themſelves ſeemingly with a degree of wiſdom far ſuperior to what we have any idea of; yet this is done without our having the leaſt knowledge either how it is done, or of its being done at all. We have therefore in ourſelves a demonſtration, that vegetable life acts without knowing what it does: and if vegetables are ignorant of their moſt ſagacious actions, why ſhould we ſuſpect that they have a ſenſation, let it be ever ſo obſcure, of any of their inferior ones, ſuch as contracting from a touch, turning towards the ſun, or advancing to meet a pole? Thus we may eaſily give the Count de Buffon a reaſon why we aſcribe ſenſation to an oyſter, and none to a vegetable; namely, becauſe we perceive the vegetable do nothing but what is alſo performed in our own bodies, without our having the leaſt ſenſation of it; whereas an oyſter puts itſelf in a defenſive poſture on the approach of danger; and this being an action ſimilar to our own upon a like occaſion, we conclude that it proceeds from the ſame principle of ſenſation. Here it may alſo be obſerved, that though the inferior animals are deficient in the number, they are by no means ſo in the acuteneſs of their ſenſations; on the contrary,

trary, though a muſcle or an oyſter is probably endowed with no other ſenſe than that of feeling, yet this ſenſe is ſo exquiſite, that it will contract upon the ſlighteſt touch, ſuch as we would be altogether inſenſible of. As to that power of contractability, or irritability, which is obſerved in ſome plants, our ſolids have it, when deprived both of vegetable and animal life: for a muſcle, cut out of a living body, will continue to contract, if it is irritated by pricking it, after it has neither ſenſation nor vegetation. The celebrated Linnæus has made out a beautiful and complete claſſification of animals, by diſtributing them into ſix claſſes, viz. *mammalia, aves, amphibia, piſces, inſecta, vermes*. Each claſs is divided into a certain number of orders, and each order is again ſubdivided into *genera*, or kinds, each of which contains a variety of ſpecies. The ſyſtem of this ingenious naturaliſt includes 354 kinds, and near 6000 known ſpecies. See his Syſtema Naturæ. For further particulars relating to different animals, their analogous ſtructure, ſagacity, inſtinct, peculiarities, &c. See Amphibious, Comparative Anatomy, Entomology, Ichthyology, Instinct, Migration, Ornithology, Oviparous, Quadruped, Viviparous, Zoology, &c.

Animal flower, in zoology, a name given to ſeveral ſpecies of animals belonging to the genus of Actinia of Linnæus. See Plate XIV. They have likewiſe been diſtinguiſhed by the names of *Urtica Marina*, or *Sea-nettle*, from their ſuppoſed property of ſtinging; and *Sea-anemone*, from their claws or tentacles being diſpoſed in regular circles, and tinged with a variety of bright lively colours, reſembling the petals of ſome of the moſt beautiful flowers. As to one ſpecies particularly, mentioned by Abbe Diequemarre, in the Phil. Tranſ. for 1773, art. 39. the pureſt white, carmine, and ultramarine, are ſaid to be ſcarce ſufficient to expreſs their brilliancy. The bodies of ſome of them are hemiſpherical, of others cylindrical, and of others ſhaped like a fig. Their ſubſtance likewiſe differs; ſome are ſtiff and gelatinous, others fleſhy and muſcular; but all of them are capable of altering their figure when they extend their bodies and claws in ſearch of food. They are found in many of the rocky coaſts of the Weſt India iſlands, and likewiſe on ſome parts of the coaſt of England. They have only one opening, which is in the centre of the uppermoſt part of the animal; round this are placed rows of fleſhy claws; this opening is the mouth of the animal, and is capable of great extenſion. The animals themſelves, though exceedingly voracious, will bear long faſting. They may be preſerved alive a whole year, or perhaps longer, in a veſſel of ſea water, without any viſible food; but, when food is preſented, one of them will ſucceſſively devour two muſcles in their ſhells, or even ſwallow a whole crab as large as a hen's egg. In a day or two the crab ſhell is voided at the mouth, perfectly clear of all the meat. The muſcle ſhells are likewiſe diſcharged whole, with the two ſhells joined together, but entirely empty, ſo that not the leaſt particle of fiſh is to be perceived on opening them. An anemone of one ſpecies will even ſwallow an individual of another ſpecies; but after retaining it ten or twelve hours, will throw it up alive and uninjured. Through this opening alſo it produces its young ones alive, already furniſhed with little claws, which, as ſoon as they fix themſelves, they begin to extend in ſearch of food. One of the extremities of the ſea-anemone reſembles, the outward leaves of that flower; while its limbs are not unlike the ſhag or inner part of it. By the other extremity it fixes itſelf, as by a ſucker, to the rocks or ſtones lying in the ſand; but it is not totally deprived of the power of progreſſive motion, as it can ſhift its ſituation, though very ſlowly. The Abbe Dicquemarre, by many curious, though cruel, experiments, related in the Phil. Tranſ. for 1773, has ſhewn, that theſe animals poſſeſs, in a moſt extraordinary degree, the power of reproduction; ſo that ſcarce any thing more is neceſſary to produce as many ſea-anemones as we pleaſe, than to cut a ſingle one into as many pieces. A ſea-anemone being cut in two, by a ſection through the body, that part, where the limbs and mouth are placed, eat a piece of a muſcle, offered to it, ſoon after the operation, and continued to feed and grow daily, for three months after. The food ſometimes paſſed through the animal; but was generally thrown up again, conſiderably changed, as in the perfect ſea-anemone. In about two months, two rows of limbs were perceived growing out of the part where the inciſion was made. On offering food to this new mouth, it was laid hold of and eat; and the limbs continually increaſing, the animal gradually became as perfect as thoſe which had never been cut. In ſome inſtances, however, he found, that when one of theſe creatures was cut through, new limbs would be produced from the cut place, thoſe of the mouth remaining as before; ſo that a monſtrous animal was the conſequence, having two mouths, and feeding at both ends. Having put ſome of them into a pan of water, ſet over a ſlow fire, he found that they loſt their life at 50 degrees of Reaumur's thermometer. To avoid the imputation of cruelty in theſe experiments, the author argues the favourable conſequences that have attended his operations on the ſea-anemones, which have been ſo fortunate as to fall into his hands; as he hath not only multiplied their exiſtence, but alſo renewed their youth; which laſt, he adds, "is ſurely no ſmall advantage." The reproductive power of the Barbadoes animal flower is prodigious. Many people coming to ſee theſe ſtrange creatures, and occaſioning ſome inconvenience to a perſon through whoſe grounds they were obliged to paſs, he reſolved to deſtroy the objects of their curioſity; and, that he might do ſo effectually, cauſed all the holes out of which they appeared, to be carefully bored and drilled with an iron inſtrument, ſo that we cannot ſuppoſe but their bodies muſt have been entirely cruſhed to a pulp; nevertheleſs, they again appeared in a few weeks, from the very ſame places. Plate XIII. Fig. 1. *a* repreſents the actinia ſociata, or cluſtered animal-flower, with its radical tube adhering to a rock, & one of the animals ſtretching out its claws. Fig. 2. *b* A perpendicular diſſection of one of the bodies, to ſhow the gullet, inteſtines, ſtomach, and fibres or tendons that move the claws: with a young one ariſing out of the adhering tube. Fig. 3. The actinia aſter, or animal-flower of the newly ceded iſlands. Fig. 4. The actinia anemone, or ſea-anemone from the ſame place. Fig. 5. The under part of the ſame by which it adheres to the rocks. Fig. 6. The actinia helianthus, or the ſea ſunflower, from ditto. Fig. 7. The under part of the ſame. Fig. 8. The actinia dianthus, or ſea carnation, from the rocks at Haſtings, in Suſſex. This animal adheres by its tail, or ſucker, to the under part of the projecting rocks oppoſite to the town; and, when the tide is out, has the appearance of a long white ſig.

ANIMAL FOOD. See FOOD.

ANIMAL FOSSILE SUBSTANCES, thoſe found buried in the earth, at various depths, and embodied among various ſtrata. Theſe are principally of four kinds: 1. Sea ſhells. 2. The teeth, bony palate, and bones of fiſhes. 3. The bones of land animals. And 4, Complete fiſh. See FOSSILS.

ANIMAL GODS, *dii animales*, in mythology, thoſe into which human ſouls were ſuppoſed to be converted, by means of certain religious ceremonies. Labeo wrote a treatiſe expreſsly on the animal gods.

ANIMAL HEAT. See HEAT.

ANIMAL MAGNETISM. See MAGNETISM.

ANIMALS, PREPARATIONS OF, FOR COLLECTIONS OR MUSEUMS. See QUADRUPEDS, BIRDS, REPTILES.

ANIMALCULA. See ANIMALCULES.

ANIMALCULAR, *adj.* belonging to an animalcule.

ANIMALCULE, *n. s.* a ſmall animal; particularly thoſe which are in their firſt and ſmalleſt ſtate. The word in general, ſignifies a little animal; and thus the term might be applied to every animal which is conſiderably inferior in ſize to ourſelves. It has been cuſtomary, however, to diſtinguiſh by the name of *animalcules*, only ſuch animals as are of a ſize ſo diminutive, that their true figure cannot be diſcerned without the aſſiſtance of glaſſes; and more eſpecially it is applied to ſuch as are altogether inviſible to the naked eye, and cannot even be perceived to exiſt but by the aſſiſtance of microſcopes. By the help of magnifying glaſſes, we are brought into a kind of new world; and numberleſs animals are diſcovered, which from their minuteneſs muſt otherwiſe for ever have eſcaped our obſervation: and how many kinds of theſe inviſibles there may be, is ſtill unknown; as they are diſcerned of all ſizes, from thoſe which are barely inviſible to the naked eye, to ſuch as reſiſt the action of the microſcope, as the fixed ſtars do that of the teleſcope, and with the beſt magnifiers hitherto invented appear only as ſo many moving points. The ſmalleſt living creatures our inſtruments can ſhow are thoſe that inhabit the waters: for though poſſibly animalcules equally minute, or perhaps more ſo, may fly in the air, or creep upon the earth, it is ſcarce poſſible to bring ſuch under our obſervation; but, water being tranſparent, and confining the creatures in it, we are able, by applying a drop of it to our glaſſes, to diſcover, to a certain degree of ſmallneſs, all that it contains.—Some of the moſt curious of theſe animalcules, which have been deſcribed by microſcopical obſervers, we ſhall here give an account of. When paſte is allowed to ſtand till it becomes ſour, it is then found to be the habitation of numberleſs animalcules, like eels, which may be diſcerned by the naked eye; and though their form cannot be perfectly diſtinguiſhed, their motion is very perceptible, and the whole paſte will ſeem to be animated. Plate XII. Fig. 1. repreſents one of theſe anguillæ magnified. The moſt remarkable property of theſe inſects is, that they are viviparous. If one of them is cut through near the middle, ſeveral oval bodies of different ſizes will be ſeen to iſſue forth. Theſe are young anguillæ, each of them coiled up and incloſed in its proper membrane, which is ſo exquiſitely fine, as ſcarcely to be diſcernible by the greateſt magnifier, while it incloſes the embryo animal. The largeſt and moſt forward immediately break through this covering, unfold themſelves, and wriggle about in the water nimbly; others get out, uncoil, and move themſelves about more ſlowly; and the leaſt mature continue entirely without motion. The *uterus*, or veſſel that contains all theſe oval bodies, is compoſed of many ringlets, not unlike the aſpera arteria of land animals, and ſeems to be conſiderably elaſtic; for as ſoon as the animalcule is cut in two, the oval bodies are thruſt out with ſome degree of violence, from the ſpringing back or action of this bowel. Upwards of 100 young ones have been ſeen to iſſue from the body of one ſingle eel, whereby the prodigious increaſe of them may be accounted for; as probably ſeveral ſuch numerous generations are produced in a ſhort time. They ſeem to be all prolific; and unleſs the trial happens to be made upon one that has brought forth all its young, or when the paſte has been kept for a very long time, the experiment will always ſucceed.—This property of theſe eels being viviparous renders it highly improbable that they ever become flies. *Animalcules* of a ſimilar kind are likewiſe found in vinegar; and, like thoſe already deſcribed, are found to be viviparous. But it is not only in acids that animalcules are ſeen; for in ſome fields of wheat, many grains may be obſerved, that appear blackiſh outwardly, as if ſcorched; but, when opened, are found to contain a ſoft white ſubſtance, which, attentively conſidered, appears to be nothing elſe than a congeries of threads or fibres lying cloſe to each other in a parallel direction, much reſembling the unripe down of ſome thiſtles on cutting open the flower heads before they begin to blow. This fibrous matter diſcovers not the leaſt ſign of life or motion, unleſs water is applied: but immediately on wetting, provided the grains of wheat have been newly gathered, the ſuppoſed fibres ſeparate, and appear to be living creatures. Their motions at firſt are very languid; but gradually become more vigorous, twiſting and wriggling themſelves ſomewhat in the manner of the eels in paſte, but always ſlower than they, and with a great deal of leſs regularity.

There is, likewiſe, a ſpecies of animalcules called *Animalcula Infuſoria*, animalcules of infuſion, which take their name from being found in all kinds either of vegetable or animal infuſions. Indeed, there is ſcarce any kind of water, unleſs impregnated with ſome mineral ſubſtance, but what will diſcover living creatures.—Mr. Lewenhoek ſays, that at firſt he could diſcern no living creatures in rain water; but after ſtanding ſome days, he diſcovered innumerable animalcules, many thouſands of times leſs than a grain of ſand, and in proportion to a mite as a bee is to a horſe.—In other rain water, which had likewiſe ſtood ſome time, he found the ſmalleſt ſort he had ever ſeen; and, in a few days more, met with others eight times as big as theſe, and almoſt round.—In another quantity of this water, that had been expoſed like the former, he diſcovered a kind of animalcules with two little horns in continual motion. The ſpace between the horns was flat, though the body was roundiſh, but tapering a little towards the end; where a tail appeared, four times as long as the body, and of the thickneſs of a ſpider's web. He obſerved ſeveral hundreds of theſe within the ſpace which a grain of ſand would occupy. If they happened on the leaſt filament or ſtring, they were entangled in it; and then would extend their bodies into an oblong round, and ſtruggle hard to diſengage their tails. He obſerved a ſecond ſort of an oval figure, and imagined the head to ſtand at the ſharpeſt end. The body was flat, with ſeveral ſmall feet moving exceeding quick, but not diſcernible without a great deal of attention. Sometimes they changed their ſhape into a perfect round, eſpecially when the water began to dry away. He met alſo with a third ſort, twice as long as broad, and eight times ſmaller than the firſt: yet in theſe he diſcerned little feet, whereby they moved very nimbly. He perceived likewiſe a fourth ſort, a thouſand times ſmaller than a louſe's eye, and which exceeded all the reſt in briſkneſs; he found theſe turning themſelves round, as it were upon a point, with the celerity of a top. And he ſays, there were ſeveral other ſorts. The production of *animalcula infuſoria* is very ſurpriſing. In four hours time, an infuſion of cantharides has produced animalcula leſs than even the tails of the ſpermatic animals deſcribed in the next ſection. Neither do they ſeem to be ſubject to the fate of other animals; but, ſeveral kinds of them at leaſt, by dividing themſelves in two, to enjoy a ſort of immortality. Nor do the common methods by which other animals are deſtroyed, ſeem to be effectual for deſtroying their vital principle. Hot mutton gravy, ſecured in a phial with a cork, and afterwards ſet among hot aſhes to deſtroy as effectually as poſſible every living creature that could be ſuppoſed to exiſt in it, has nevertheleſs been found ſwarming with animalcules after ſtanding a few days. In the Philoſophical Tranſactions, Vol. LIX. we have the following curious account, given us by Mr. Ellis, of animalcules, produced from an infuſion of potatoes and of Hempſeed. "On the 25th of May 1768, Farenheit's 70°, I boiled a potatoe in the New River water, till it was reduced to a mealy conſiſtence. I put part of it, with an equal proportion of the boiling liquor into a cylindrical glaſs veſſel that held ſomething leſs than half a wine pint, and covered it cloſe immediately with a glaſs cover. At the ſame time, I ſliced an unboiled potatoe; and, as near as I could judge, put the ſame quantity into a glaſs veſſel of the ſame kind; with the ſame proportion of New River water not boiled; and covered it with a glaſs cover; and placed both veſſels cloſe to each other. On the 26th of May, 24 hours afterwards, I examined a ſmall drop of each, by the firſt magnifier of Wilſon's microſcope, whoſe focal diſtance is reckoned at one fiftieth part of an inch; and, to my amazement they were both full of animalcula of a linear ſhape, very diſtinguiſhable, moving to and fro with great celerity; ſo that there appeared to be more particles of animal than of vegetable life in each drop. This experiment I have repeatedly tried, and always found it to ſucceed in proportion to the heat of the circumambient air; ſo that even in winter, if the liquors are kept properly warm, at leaſt in two or three days the experiment will ſucceed. What I have obſerved, are infinitely ſmaller than ſpermatic animals, and of a very different ſhape; the truth of which every accurate obſerver will ſoon be convinced of, whoſe curioſity may lead him to compare them; and I am perſuaded he will find they are no way akin. At preſent I ſhall paſs over many other curious obſervations, which I have made on two years experiments, in order to proceed to the explaining a hint which I received laſt January from Mr. De Sauſſure, of Geneva, when he was here, which is, that he found one kind of theſe animalcula infuſoria that increaſe by dividing acroſs into nearly two equal parts. I had often ſeen this appearance in various ſpecies a year or two ago, as I found upon looking over the minutes I had taken when I made any new obſervations; but always ſuppoſed the animal, when in this ſtate, to be in coition. Not hearing, till after M. De Sauſſure left this kingdom, from what infuſion he had made his obſervation, his friend, Dr. de la Roche, of Geneva, informed me, the latter end of February laſt, that it was from hempſeed. I immediately procured hempſeed from different ſeedſmen in diſtant parts of the town. Some of it I put into New River water, ſome into diſtilled water, and ſome I put into very hard pump water. The reſult was, that in proportion to the heat of the weather, or the warmth in which they were kept, there was an appearance of millions of minute animalcula in all the infuſions; and ſome time after, ſome oval ones made their appearance, as at fig. 3. *b c*. Theſe were much larger than the firſt, which ſtill continued; theſe wriggled to and fro in an undulatory motion, turning themſelves round very quick all the time that they moved forwards. I was very attentive to ſee theſe animals divide themſelves; and at laſt I perceived a few of the appearance of fig. 3. *a*, Pl. XII. as repreſented by the firſt magnifier of Wilſon's microſcope; but I am ſo well convinced by experience that they would ſeparate, that I did not wait to ſee the operation: however, as the following ſketches, which I have drawn from five other ſpecies, will fully explain this extraordinary phenomenon, there will be no difficulty in conceiving the manner of the firſt. See Pl. XII. fig. 4, 5, 6, 7, 8. The proportion of the number of theſe animals, which I have obſerved to divide in this manner, to the reſt, is ſcarce 1 to 50; ſo that it appears rather to raiſe from hurts received by ſome few animalcula among the many, than to be the natural manner in which theſe kinds of animals multiply; eſpecially if we conſider the infinite quantity of young ones which are viſible to us through the tranſparent ſkins of their bodies, and even the young ones that are viſible in thoſe young ones while in the bodies of the old ones.—But nothing more plainly ſhows them to be zoophites than this circumſtance, That when, by accident, the extremity of their bodies has been ſhrivelled for want of a ſupply of freſh water, the applying more freſh water has given motion to the part of the animal that was ſtill alive; by which means, this ſhapeleſs figure has continued to live and ſwim to and fro all the time it was ſupplied with freſh water."

The diſcovery of living animalcules in the ſemen of moſt animals is claimed by Mr. Lewenhoek and Mr. Nicholas Hartſoeker; who both ſay they publiſhed it about the end of the year 1677 or beginning of 1678: but Mr. Lewenhoek having given the moſt particular deſcription of, and made by far the greateſt number of experiments concerning them, the diſcovery is commonly attributed to him.—According to this natualiſt, theſe animalcules are found in the ſemen maſculinum of every kind of animal; but their general appearance is very much the ſame, nor doth their ſize differ in proportion to the bulk of the animal to which they belong. The bodies of all of them ſeem to be of an oblong oval form, with long tapering ſlender tails iſſuing from them; and as by this ſhape they reſemble *tadpoles*, they have been frequently called by that name; though the tails of them, in proportion to their bodies, are much longer than the tails of tadpoles are: and it is obſervable, that the animalcules in the ſemen of fiſhes have tails much longer and more ſlender than the tails of thoſe in other animals; inſomuch, that the extremity of them is not to be diſcerned without the beſt glaſſes, and the utmoſt attention. Pl. XII. fig. 21. No. 1, 2, 3, 4, repreſent the ſpermatic animalcula of the rabbit; and No. 5, 6, 7, 8, thoſe of a dog; according to Mr. Lewenhoek.—The numbers of theſe animalcula are inconceivable. On viewing with a microſcope the milt or ſemen maſculinum of a living codfiſh, innumerable multitudes of animalcules were found therein, of ſuch a diminutive ſize, that he ſuppoſed at leaſt 10,000 of them capable of being contained in the bulk of a grain of ſand; whence he concludes, that the milt of this ſingle fiſh contained more living animalcules than there are to be found people living in the whole world. Theſe animalcula are peculiar to the ſemen; nothing that has the leaſt token of life being diſcovered, by the beſt glaſſes, either in the blood, ſpittle, urine, gall, or chyle. Great numbers, however, are to be found in the whitiſh matter that ſticks between the teeth; ſome of which are of an oval figure, and others reſembling eels.

The aquatic worm animalcule is ſhown, magnified, Pl. XI. fig. 31. It is found in ditch water; and is of various ſizes, from one 40th to one half of an inch in length. About the head it has ſomewhat of a yellowiſh colour; but all the reſt of the body is perfectly colourleſs and tranſparent, except the inteſtines, which are conſiderably opaque, and diſpoſed as in the figure. Along its ſides are ſeveral papillæ, with long hairs growing from them: it has two black eyes, and is very nimble. But the moſt remarkable thing in this creature is a long horn or proboſcis; which, in the large ones, may be ſeen with the naked eye if the weather is clear, and is ſometimes one tenth of an inch in length: this it waves to and fro as it moves in the water, or creeps up the ſide of the glaſs; but it is not known whether it is hollow, or of what uſe it is to the creature itſelf.

The Bell-Flower or Plumed Polype Animalcules dwell in colonies together, from ten to fifteen, in a ſlimy kind of mucilaginous or gelatinous caſe; which out of the water, has no determined form, appearing like a little lump of ſlime; but when expanded therein, has ſome reſemblance to the figure of a bell with its mouth upwards; and is uſually about half an inch long, and a quarter of an inch in diameter. Theſe bells, or colonies, are to be found adhering to the large leaves of duckweed, and other aquatic plants. They may be moſt eaſily diſcovered by letting a quantity of water, with duckweed in it, ſtand quietly for three or four hours in glaſs veſſels in a window, or other place whence a ſtrong light comes; for then, if any are about the duckweed, they will be found, on careful inſpection, extending themſelves out of their caſes, and making an elegant appearance.—The bell, or caſe, which theſe animals inhabit, being very tranſparent, all the motions of its inhabitants may be diſcerned through it diſtinctly. It ſeems divided internally into ſeveral apartments, or rather to contain ſeveral ſmaller ſacculi, each of which incloſes one of theſe animals. The openings at the tops of theſe ſacculi, are but juſt ſufficient to admit the creature's head and a ſmall part of its body to be thruſt out beyond them, the reſt remaining always in the caſe. It can, however, occaſionally retire in its caſe altogether; and never fails to do ſo when alarmed by any ſudden motion of the water, or of the veſſel which contains it.—Beſides the particular and ſeparate motion which each of theſe creatures is able to exert within its own caſe, and independent of the reſt, the whole colony together has a power of altering the poſition of the bell, or even of removing it from one place to another; and hence this bell is ſometimes found ſtanding perfectly upright, as in Pl. XI. fig. 29, 33, and ſometimes bending the upper part downwards, as in fig. 30. As theſe animalcules ſeem not to chooſe to ſtay together in ſocieties whoſe number exceeds 15, when the colony happens to increaſe in number, the bell may be obſerved to ſplit gradually, beginning from about the middle of the upper or anterior extremity, and proceeding downwards towards the bottom, as in fig. 32, till they at laſt ſeparate entirely, and become two complete colonies independent of each other, one of which ſometimes removes to another part of the veſſel. The arms of each individual of this colony are ſet round the head, to the number of 40, having each the figure of an Italic *ſ*, one of whoſe hooked ends is faſtened to the head; and all together, when expanded, compoſe a figure ſhaped ſomewhat like a horſe's ſhoe, convex on one ſide next the body, but gradually opening and turning outwards, ſo as to leave a conſiderable area within the outer extremities of the arms. When the arms are thus extended, the creature, by giving them a vibrating motion, can produce a current in the water, which brings the animalcules, or whatever other minute bodies are within the ſphere of its action, with great velocity to its mouth, ſituated between the arms; where they are taken in if liked, or driven away by a contrary motion. The food is conveyed immediately from the mouth or opening between the arms, through a narrow neck, into a paſſage ſeemingly correſpondent to the œſopagus in land animals, down which it paſſes into the ſtomach, where it remains for ſome time, and then is voided upwards, in ſmall round pellets, through a gut whoſe exit is near the neck. The body conſiſts of three diviſions; in the uppermoſt of which are contained all the abovementioned inteſtines, which are only to be diſcerned when the creature is full, at which time they become opaque. The other two diviſions, which are probably fixed to the bell, ſeem to be of no other uſe than to give the creature a power of contraction and extenſion. The arms are not able to contract like thoſe of the common polype; but, when the animal retires into its caſe, they are brought together in a cloſe and curious order, ſo as to be eaſily drawn in. Though their general appearance when expanded is that of a cup whoſe baſe and top are of an horſe-ſhoe form, they ſometimes ſeparate into four parts, and range themſelves as in fig. 36, ſo as to reſemble four ſeparate plumes of feathers. Though their eyes cannot be diſcovered, yet Mr. Baker thinks they have ſome perception of light: for when kept in the dark, they always remain contracted; but on being expoſed to the light of the ſun or of a candle, they conſtantly extend their arms, and ſhow evident ſigns of being pleaſed. Fig. 29, repreſents one complete colony or bell ſtanding erect, with all the animals out of their kingdom, and their arms extended, exhibiting all together a very pretty appearance. *a* repreſents two oval bodies, ſuppoſed by Mr. Baker to be eggs. Fig. 30, ſhows all the creatures withdrawn into their cells, and the end of the bell hanging downwards. Fig. 33, ſhows the bell erect, with only one of the animals coming out, in order to ſhow its connection with the bell. Fig. 34, ſhows the head and arms of a ſingle polype cloſing together, and diſpoſing themſelves in order to be drawn into the bell. Fig. 35, ſhows one complete animal, greatly magnified, to ſhow its ſeveral parts more diſtinctly; viz. *a*, the head, reſembling a horſe ſhoe; *b b*, the arms ſeen from one ſide; *c*, the narrow neck; *d*, the œſophagus; *e*, the ſtomach; *f*, the gut or laſt inteſtines through which the food paſſes after being digeſted in the ſtomach; *g*, the anus, where the feces are diſcharged in the little pellets, *b i*, that part of the bell which ſurrounds the body of the animal, and cloſes upon it when it retires down. Fig. 37, the head and arms ſeen in front.

The Globe Animalcule, repreſented in Plate XI. Fig. 38, is exactly globular, having no appearance of either head, tail, or fins. It moves in all directions, forwards or backwards, up or down, either rolling over and over like a bowl, ſpinning horizontally like a top, or gliding along ſmoothly without turning itſelf at all. Sometimes its motions are ſlow, at other times very ſwift; and when it pleaſes, it can turn round, as it were upon an axis, very nimbly, without removing out of its place. The whole body is tranſparent, except where the circular black ſpots are ſhown in the figure. Some of the animals have no ſpots, and others from one to ſeven. The ſurface of the whole body appears, in ſome, as if all over dotted with points; in others, as if granulated like ſhagreen: but their more general appearance is, as if beſet thinly round with ſhort moveable hairs or briſtles, which probably are the inſtruments by which their motions are performed. Theſe animalcules, ſeen by the naked eye, appear only like moving points.—The Hair like animalcule or inſect, is ſo called by Mr. Baker on account of its ſhape, being extremely ſlender, and frequently an hundred and fifty times as long as broad. The body or middle part, which is nearly ſtraight, appears, in ſome, compoſed of ſuch rings as the windpipe of land animals is made up of; but in others, ſeems rather ſcaled, or made up of rings that obliquely croſs one another. Its two ends are hooked or bent, pretty nearly in the ſame degree, but in a direction oppoſite to one another; and as no eyes can be diſcerned, it is difficult to judge which is the head or tail. Its progreſſive motion is very ſingular, being performed by turning upon one end as a centre, and deſcribing almoſt a quarter of a circle with the other, as repreſented in Plate XI. Fig. 1. Its motions are very ſlow, and require much patience and attention in the obſerver. Theſe creatures are ſo ſmall, that millions of millions of them might be contained in an inch ſquare. When viewed ſingly, they are exceedingly tranſparent, and of a beautiful green colour; but when numbers of them are brought together, they become opaque, loſe their green colour, and grow entirely black.—The properties and ſhape of the net-like haired animalcule, are very extraordinary. It is found only in caſcades, where the water runs very ſwift. There theſe inſects are found in cluſters, ſtanding on their tails; and reſembling when all together, the combs of bees at the time they are filled with their aureliæ. On being taken out of the water they ſpin threads, by which they hang exactly in the ſame manner as the garden ſpider. Fig. 42, ſhows one of theſe inſects magnified. Its body appears curiouſly turned as upon a lathe; and at the tail are three ſharp ſpines, on which it raiſes itſelf, and ſtands upright in the water: but the moſt curious apparatus is about its head, where it is furniſhed with two inſtruments like fans or nets, which ſerve to provide its food. Theſe it frequently ſpreads out and draws in again; and when drawn up they are folded together with the utmoſt nicety and exactneſs, ſo as to be indiſcernible when brought cloſe to the body. At the bottom of theſe fans a couple of claws are faſtened to the lower part of the head, which, every time the nets are drawn in, conduct to the mouth of the animal whatever is taken in them. When the creature doth not employ its nets, it thruſts out a pair of ſharp horns, as in fig. 41, where the inſect is ſhown magnified about 400 times. Some of theſe creatures being kept with water in a vial, moſt of them died in two days; and the reſt having ſpun themſelves tranſparent caſes (which were faſtened either to the ſides of the glaſs, or to pieces of graſs put into it,) ſeemed to be changed into a kind of chryſalis: but before taking this form, they appeared as in fig. 43. which ſhape they likewiſe aſſumed when weary with catching their food, or when lying in wait for it.—The pipe animalcules are found on the coaſt of Norfolk, in England, living in ſmall tubes or caſes of ſandy matter, in ſuch multitudes as to compoſe a maſs ſometimes of three feet in length. Fig. 39, ſhows a piece of ſuch a congeries broke off, where *a a a a* repreſent the mouths or openings of the pipes wherein the little animals make their abode. Fig. 40, ſhows one ſingle pipe, with its inhabitant, ſeparated from the reſt, and magnified nine or ten times in the diameter. The pipe or caſe *b* is made of ſand, intermixed here and there with minute ſhells, and all cemented together by a glutinous ſlime, probably iſſuing from the animal's own body *c*, which is compoſed of muſcular ringlets like thoſe of a worm, capable of great extenſion or contraction. The anterior end or head, *d*, is exceedingly beautiful, having round it a double row of little arms diſpoſed in a very regular order, and probably capable of extenſion, in order to catch its food, and bring it to its mouth. Some of theſe tubes are found petrified, and conſtitute one ſpecies of ſyringoides.—There is an animalcule, which has been dignified by Mr. Baker with the name of *Proteus*, on account of its aſſuming a great number of different ſhapes, ſo as ſcarce to be known as the ſame animal in its various transformations; and indeed unleſs it be carefully watched while paſſing from one ſhape to another, it will often become ſuddenly inviſible. When water, wherein any ſort of vegetable has been infuſed, or animals preſerved, has ſtood quietly for ſome days, in any glaſs or other veſſel, a ſlimy ſubſtance will be collected about the ſides; ſome of which, being taken up with the point of a pen-knife, placed on a ſlip of glaſs in a drop of water, and inſpected through the microſcope, will be found to harbour ſeveral kinds of little animals that are ſeldom ſeen ſwimming about at large; among which the proteus is one. Its ſhape is better underſtood from the figure, than from any deſcription which could be given. Its ſubſtance and colour ſeems to reſemble that of a ſnail; and its whole ſhape ſeems to bear a near reſemblance to a ſwan. ‘It ſwims to and fro with great vivacity; but will now and then ſtop a minute or two: during which time its long neck is uſually employed as far as it can reach, forwards, and on every ſide, with a ſomewhat ſlow, but equable motion, like that of a ſnake, frequently extending thrice the length of its body, and ſeemingly in ſearch of food. There are no eyes, nor any opening in the head like a mouth to be diſcerned: but its actions plainly prove it to be an animal that can ſee; for though multitudes of different animalcules ſwim about in the ſame water, and its own progreſſive motion is very ſwift, it never ſtrikes againſt any of them, but directs its courſe between them with a dexterity wholly unaccountable ſhould we ſuppoſe it deſtitute of ſight. When the proteus is alarmed, it ſuddenly draws in its long neck, repreſented in fig. 5, and 6, transforming itſelf into the ſhape repreſented in fig. 7, when it becomes more opaque, and moves about very ſlowly with the large end foremoſt. When it has continued for ſome time in this poſture, it will often, inſtead of the head and neck it had formerly, put forth a new one, with a kind of wheel machinery, repreſented fig. 8, the motions of which draw a current of water to it from a conſiderable diſtance. Having often pulled in and thruſt out this ſhort head, ſometimes with and ſometimes without the wheel work, the creature, as if weary, will remain motionleſs for a while; then its head and long neck will be very ſlowly protruded, as in fig. 9, and it ſoon reſumes its former agility. Sometimes it diſpoſes of its neck and head as repreſented in fig. 10. Plate XII. Fig. 3, 4, 5, 6, 7, 8, repreſent different animalcula infuſoria, mentioned by Mr. Ellis belonging to the genus of volvox of Linnæus. Fig. 3, repreſents the volvox ovalis, or egg-ſhaped volvox; at (b) and (c) it is expreſſed in its natural ſhape; at (a) the manner in which it becomes two animals, by ſeparating acroſs the middle. This was found in the infuſion of hempſeed; but is found in other vegetable infuſions, particularly that of tea-ſeed. Fig. 4, is the volvox torquilla, or wryneck. At (a) is repreſented its divided ſtate; at (b) and (c) its natural ſtate: this is common to moſt vegetable infuſions, as is the following. Fig. 5, is the volvox volutans, or the roller. At (a) the animal is ſeparated, and becomes two diſtinct beings, each ſwimming about and providing for itſelf: this is often the prey of another ſpecies of this genus, eſpecially while it is weak by this ſeparation, not being ſo active for ſome time till it can recover itſelf. At (c) the animal appears to be hurt on one ſide; this impreſſion in a little time is ſucceeded by another in the oppoſite ſide, as at (b), which ſoon occaſions a diviſion. At (d) is the ſide view, and at (e) the front view, of the natural ſhape of the animal. Fig. 6, is the volvox oniſcus, or wood-louſe. At (a) is the natural ſhape of it, as it appears full of little hairs both at the head and tail; with thoſe at the head, it whirls the water about to draw its prey to it; the feet, which are many, are very viſible, but remarkably ſo in a ſide-view at (d). At (b) it is repreſented beginning to divide; and at (c) the animals are ready to part: in this ſtate, as if in exquiſite pain, they ſwim round and round, and to and fro, with uncommon velocity, violently agitated till they get aſunder. This was found in an infuſion of different kinds of pine branches. Fig. 7. is the volvox terebella, or the gimlet. This is one of the largeſt kind, and is very viſible to the naked eye. It moves along ſwiftly, turning itſelf round as it ſwims, juſt as if boring its way. (a) and (b) are two views of its natural ſhape, (c) ſhows the manner of its dividing. When they are ſeparated, the lower animal rolls very awkwardly along, till it gets a groove in the upper part. (d) repreſents one of them lying torpid, by means of the juice of the horſe-ſhoe geranium, with its fins extended. This animal is found in many infuſions, particularly of graſs or corn. Fig. 8, is the volvox vorax, or glutton. This animal was found in an infuſion of the Tartarian pine; it varies its ſhape very much, contracting and extending its proboſcis, turning it to and fro, in various directions, as at a, b, c, d, e. It opens its proboſcis underneath the extremity, when it ſeizes its prey. The leſs active animals, that have been divided, ſuch as thoſe at fig. 3, (a), and at fig. 4, (a), ſerve it as food, when they come in its way: theſe it ſwallows down inſtantly, as it is repreſented at fig. 8, (b) and (i). At (f) it is ready to divide, and at (g) it is divided; where the hinderpart of the divided animal has got a proboſcis or beak, to procure nouriſhment for itſelf, and ſoon becomes a diſtinct being from the fore part. The animalcule called the verticella, or wheel, is found in rain water that has ſtood ſome days in leaden gutters, or in hollows of lead on the tops of houſes; or in the ſlime or ſediment left by ſuch water; and perhaps may alſo be found in other places: but if the water ſtanding in gutters of lead, or the ſediment left behind it, has any thing of a lead colour in it, one may be almoſt certain of finding them therein. Though it diſcovers no ſigns of life except when in the water, yet it is capable of continuing alive for many months after it is taken out of the water, and kept in a ſtate as dry as duſt. In this ſtate it is of a globular ſhape, exceeds not the bigneſs of a grain of ſand, and no ſigns of life appear: but, being put into water, in half an hour, a languid motion begins, the globule turns itſelf about, lengthens itſelf by ſlow degrees, aſſumes the form of a lively maggot, and moſt commonly in a few minutes afterwards puts out its wheels; ſwimming vigorouſly through the water, as if in ſearch of food; or fixing itſelf by the tail, works the wheels in ſuch a manner as to bring its food to it. Pl. XI. Fig. 23, and 24, ſhow the wheel animalcule, in its globular form; fig. 11, and 12, in its maggot ſtate; and fig. 13, 14, 15, 16, 17, 18, 19, 20, 21, and 22, ſhow the different appearances of its wheels, and alſo its various intermediate changes between the globular and maggot ſtate. The moſt remarkable part of this animalcule is its wheel work. This conſiſts of a couple of ſemicircular inſtruments, round the edges of which many little fibrillæ move themſelves very briſkly, ſometimes with a kind of rotation, and ſometimes in a trembling or vibrating manner. When in this ſtate, it ſometimes unfaſtens its tail, and ſwims along with a great deal of ſwiftneſs, ſeemingly in purſuit of its prey. Sometimes the wheels ſeem to be entire circles, armed with ſmall teeth like thoſe of the balance-wheel of a watch, appearing projected forwards beyond the head, and extending ſideways, ſomewhat wider than its diameter. The teeth or cogs of theſe wheels ſeem to ſtand very regularly at equal diſtance: but the figure of them varies according to their poſition, the degree of their protruſion, and perhaps the will of the animal itſelf. They appear ſometimes like minute oblong ſquares, riſing at right angles from the periphery of a circle, like ancient battlements on a round tower; at other times they terminate in ſharp points, and altogether reſemble a kind of Gothic crown. They are often ſeen in a kind of curvular direction, all bending the ſame way, and ſeeming like ſo many hooks; and now and then the ends of them will be perceived to be clubbed like mallets. This figure, however, as well as the firſt, they aſſume but rarely. As theſe wheels are every where exceſſively tranſparent, except about their circular rim or edge, where the cogs are ſet, it is very difficult to determine by what contrivance they are turned about, or what their real figure is, though they ſeem exactly to reſemble wheels moving round upon an axis. It is alſo hardly poſſible to be certain whether thoſe circular bodies in which the teeth are ſet, are of a flat form, or hollow and conical; but they ſeem rather to be of a conical figure. The difficulty of conceiving how an articulation could be contrived ſo as to cauſe a real rotation, hath cauſed many people to imagine that there was a deception in this caſe: But Mr. Baker aſſures us, that when the wheels are fully protruded, they never fail to ſhow all the viſible marks of a regular rotation; and, in ſome poſitions, the ſame cogs or teeth may be traced by the eye during a complete revolution. All the actions of this creature ſeem to imply ſagacity and quickneſs of ſenſation. At the leaſt touch or motion in the water, they inſtantly draw in their wheels; and Mr. Baker conjectures, that their eyes are lodged ſomewhere about the wheels: becauſe, while in the maggot ſtate, its motions are ſlow and blundering; but after the wheels are protruded, they are performed with great regularity, ſwiftneſs, and ſteadineſs. Notwithſtanding the minuteneſs of this animalcule, the microſcope generally diſcovers others in the ſame drop of water, compared with which, the wheel animal may be ſaid to be a whale. The tranſparency of its body allows its internal parts to be ſeen, which cannot be perceived in the minuteſt animalcules on account of the ſmallneſs of their ſize. Fig. 15, *a*, is the appearance of the head; and though it is every where tranſparent, a ring or circle more particularly remarkable for its clearneſs is commonly perceived about the middle of the forehead, a little above the mouth. This, Mr. Baker thinks, might juſtly be called the ſeat of the brain. Many veſſels which ſeem to take their origin from thence are diſcernible in the head, where ſome tranſparent fluid appears continually agitated by a kind of fluctuating motion. The thorax, *b*, is joined to the head by a very ſhort neck, *c*, and appears to be about the ſixth part of the whole length of the animal. In the middle of the thorax is placed the heart, *d*, where its ſyſtole and diaſtole is plainly viſible. It is ſeen through the back of the inſect, ſhutting and opening alternately with great regularity and exactneſs. Its ſize is proportionate to the creature's bigneſs; and its ſhape, during the ſyſtole, is nearly circular, being compoſed ſeemingly of two ſemilunar parts, which then approach each other laterally, and form between them a roundiſh or horſe ſhoe like figure, whoſe upper ſide is flat, and the under one convex. The diaſtole is performed by a ſeeming ſeparation, or opening, of theſe two ſemilunar parts, whereby the tranſverſe diameter of the heart is very much enlarged. This ſeparation begins exactly in the middle of the lower part next the tail; and opens to ſuch a conſiderable width upwards, that the two parts, when at their utmoſt diſtenſion, ſeem only joined by an arched veſſel at their anterior end. The alternate motions of contraction and dilatation are performed with great ſtrength and vigour, in pretty much the ſame time as the pulſation of the arteries of a man in health. The motions of the heart are communicated to all the internal parts of the thorax; and ſeem to extend a great deal further; for a ſtrict examination diſcovers, at the ſame time, throughout the whole animal, contractions and dilatations going on, that are apparently correſpondent thereto. Theſe motions of the heart, however, are ſometimes ſuſpended, or imperceptible, for two or three minutes; after which they are renewed, and go on again with the ſame regularity as before. From the under part of the thorax proceeds a ſmall tranſparent horn repreſented at *e*, fig. 11, and 12. It is never viſible but when the animal turns on its back or ſide.—Immediately below the thorax is another annular diviſion, *e*, joining upwards to the thorax, and downwards to the abdomen, the entrance whereof it ſerves occaſionally to enlarge or diminiſh. The abdomen, *f*, is by much the largeſt part of the animal, and contains the ſtomach and inteſtines. When the inſect is full of food, theſe bowels appear opaque and of a blood-red colour, extending quite through the belly and great part of the tail, and exhibiting a variety of contractions and dilatations. The belly is capable of ſtretching out greatly in length, or being ſhortened very much, and widening its diameter. It aſſumes many ſhapes, and becomes occaſionally a caſe for all the other parts of the body.—Beſides the above-mentioned one, there are found in the waters ſeveral other ſpecies of animals furniſhed with wheels, ſome of which have a rotatory, and others a vibratory, motion. Fig. 25, repreſents a kind found in the ditch at Norwich, where the hair-like inſect is produced. They differ from the foregoing only in having very long tails. Fig. 26, 27, and 28, repreſent a ſpecies of wheel animals, which are alſo covered with ſhells. The body of this ſpecies conſiſts of three parts, in like manner as the other; only the thorax and abdomen, in this, are not ſeparated by any gut, or intermediate veſſel, but are joined immediately together. The heart is plainly perceived, having a regular ſyſtole and diaſtole, at *a*, as in the former ſpecies. Theſe creatures occaſionally draw themſelves entirely within their ſhells; and the ſhell then appears terminated by ſix ſhort ſpikes on one ſide and two on the other.—The young of this ſpecies are carried in oval ſacculi, or integuments, faſtened externally to the lower part of their ſhells ſomewhere about the tail: theſe ſacculi are ſometimes opaque only at one end, and ſeemingly empty at the other; ſometimes they appear opaque in the middle, with a tranſparency all round, as in fig. 26. When a young one is about to burſt its integuments, the parent aſſiſts it greatly, by wagging its tail, and ſtriking the oval bag, ſo that the young one's head becomes as it were forced into the water, though the tail cannot be ſo ſoon diſengaged. Fig. 28, *b*. In this condition the young one ſets its wheel a-going, and exerts all its endeavours to free itſelf from its confinement. When it has got clear, it ſwims away, wagging its tail as the old one does, and leaving the integument adhering to the ſhell of the parent. The old one then uſes a number of efforts to get rid of this incumbrance, ſtriking againſt it with her tail, fixing the end of her tail upon it, and then darting her body forward; with ſeveral very odd motions not eaſy to be deſcribed. This kind of wheel-animals are great tormentors of the water-flea, of Swammerdam. Theſe inſects are often found in great numbers in the ſame water and when that is the caſe, it is not uncommon to diſcover five or ſix of theſe cruſtaceous wheel-animals faſtened by their tail to the ſhell or horns of the flea; cauſing it, ſeemingly, a vaſt deal of uneaſineſs; nor can they be driven away, or ſhaken off, by all the efforts the flea can uſe for that purpoſe.

Having thus given a deſcription of the moſt remarkable ſpecies of animalcules, we ſhall conclude this article by ſome remarks on this minute part of creation. Before the invention of microſcopes, the doctrine of equivocal generation, both with regard to animals and plants of ſome kinds, was univerſally received: but this inſtrument ſoon convinced every intelligent perſon, that thoſe plants which formerly were ſuppoſed to be produced by equivocal generation aroſe from ſeeds, and the animals, in like manner, from a male and female. But while the microſcope threw light upon one part of nature, it left another involved in darkneſs; for the origin of the animalcula infuſoria, or of the ſpermatic animals already mentioned, remains as yet as much unknown as that of many other kinds was, when the doctrine of equivocal generation reigned in full force. The diſcovery of ſpermatic animalcules was thought to throw ſome light on the myſterious affair of generation itſelf, and theſe minute creatures were imagined to be each of them individuals of the ſame ſpecies with the parent. Here the infinite number of theſe animalcules was an objection, and the difficulty remained as great as before; for, as every one of theſe animalcules behoved to be produced from a male and female, to explain their origin by animalcular generation in the ſame manner, was only explaining generation by itſelf. This hypotheſis, therefore, having proved unſatisfactory, Count Buffon, hath invented another by which he at once annihilates the whole animalcular world; but as he gives ſuch a particular account of his having examined the human ſemen, that we cannot doubt of his accuracy, we ſhall here contraſt his account with that of Mr. Lewenhoek already mentioned. Having procured the ſeminal veſſels of a man who died a violent death, he extracted all the liquor from them while they were ſtill warm; and having examined a drop of it with a double microſcope, it appeared as in Pl. XI. fig. 9. Large filaments appeared, which in ſome places ſpread out into branches, and in others intermingled with one another. Theſe filaments clearly appeared to be agitated by an internal undulatory motion, like hollow tubes, which contained ſome moving ſubſtance. He ſaw diſtinctly this appearance changed for that of fig. 10. Two of theſe filaments, which were joined longitudinally, gradually ſeparated from each other in the middle, alternately approaching and receding, like two elaſtic cords fixed by the ends, and drawn aſunder in the middle. Theſe filaments were compoſed of globules that touched one another, and reſembled a chaplet of beads. After this he obſerved the filaments ſwelled in ſeveral places, and perceived ſmall globular bodies iſſue from the ſwelled parts, which had a vibratory motion like a pendulum. Theſe ſmall bodies were attached to the filaments by ſmall threads which gradually lengthened as the bodies moved. At laſt, the ſmall bodies detached themſelves entirely from the filaments, drawing after them the ſmall thread which looked like a tail. When a drop of the ſeminal liquor was diluted, theſe ſmall bodies moved in all directions very briſkly; and had he not ſeen them ſeparate themſelves from the filaments, he would, he ſays, have thought them to be animals. The ſeminal matter was at firſt too thick, but gradually became more fluid: and, in proportion as its fluidity increaſed, the filaments diſappeared, but the ſmall bodies became exceedingly numerous. Each of them had a long thread or tail attached to it, from which it evidently endeavoured to get free. Their progreſſive motion was extremely ſlow, during which they vibrated to the right and left, and at each vibration they had a rolling unſteady motion in a vertical direction. At the end of two or three hours, the ſeminal matter becoming ſtill more fluid, a greater number of theſe moving bodies appeared. They were then more free of incumbrances; their tails were ſhorter; their progreſſive motion was *more direct*, and their horizontal motion greatly diminiſhed. In five or ſix hours, the liquor had acquired almoſt all the fluidity it could acquire, without being decompoſed. Moſt of the ſmall bodies were now diſengaged from their threads; their figure was oval. They moved forward with conſiderable quickneſs, and, by their irregular motions backward and forward, they had now more than ever the appearance of animals. Thoſe that had tails adhering to them, ſeemed to have leſs vivacity than the others; and of thoſe that had no tails, ſome altered both their figure and their ſize. In twelve hours, the liquor had depoſited at the bottom of the vial a kind of aſh coloured gelatinous ſubſtance, and the fluid at top was almoſt as tranſparent as water. The little bodies being now entirely freed from their threads, moved with great agility, and ſome of them turned round their centres. They alſo often changed their figures, from oval becoming round, and often breaking into ſmaller ones. Their activity always increaſed as their ſize diminiſhed. In 24 hours, the liquor had depoſited *a greater quantity of* gelatinous matter, which, being with *ſome difficulty diluted* in water, exhibited an appearance ſomewhat reſembling lace. In the clear ſemen itſelf only a few ſmall bodies were now ſeen moving; next day, theſe were ſtill farther diminiſhed; and after this nothing was to be ſeen but globules, without the leaſt appearance of motion. Figure ſeventeen and eighteen, repreſent the appearance of the globules in another experiment, in which they arranged themſelves in troops, and paſſed very quickly over the field of the microſcope. In this experiment they were found to proceed from a ſmall quantity of gelatinous mucilage.—From the above experiments, Buffon concludes, that what have been called ſpermatic animals, are not creatures really endued with life, but ſomething proper to compoſe a living creature; and he diſtinguiſhes them by the name of *organic particles*. The ſame individual kinds of animals he declares he has found in the fluids ſeparated from the ovaria of females; and for the truth of this appeals to the teſtimony of Mr. Needham, who was an eye witneſs of his experiments. He alſo begins an additional proof of his doctrine from Mr. Needham's obſervations on the milt of the *calmar*, a ſpecies of cuttle fiſh. Here the ſpermatic animals, at leaſt what have the only appearance of life, are vaſtly larger than in any other creature, ſo as to be plainly viſible to the naked eye. When magnified, they appear as at Pl. XI. fig. 19, and 20, *a*. Their firſt appearance is at fig. 19, *a* and *b*, when they reſemble ſprings incloſed in a tranſparent caſe. Theſe ſprings were equally perfect at firſt as afterwards; only in time they contracted themſelves, and became like a kind of ſcrew. The head of the caſe is a ſpecies of valve which opens outward, and through which every thing within may be forced out. It contains, beſides, another valve, *b*, a little barrel *c*, and a ſpongy ſubſtance *d e*. Thus, the whole machine conſiſts of an outer tranſparent cartilaginous caſe, fig. 20, *a*, the ſuperior extremity of which is terminated by a round head formed by the caſe itſelf, and performs the office of a valve. This external caſe contains a tranſparent tube; which includes the ſpring, piſton or valve, a little barrel, and a ſpongy ſubſtance. The ſcrew occupies the ſuperior part of the tube and caſe, the piſton and barrel are ſituated in the middle, and the ſpongy ſubſtance occupies the inferior part. Theſe machines pump the liquor of the milt; the ſpongy ſubſtance is full of this liquor; and, before the animal ſpawns, the whole milt is only a congeries of theſe bodies which have ſucked up all the liquor of it. Whenever theſe ſmall machines are taken out of the body of the animal, and put in water, or expoſed to the air, they begin to act, as repreſented fig. 19, and 20; the ſpring mounts up, and is followed by the piſton, the barrel, and the ſpongy ſubſtance which contains the liquor: and, as ſoon as the ſpring and the tube in which it is contained begin to iſſue out of the caſe, the ſpring plaits, and the whole internal apparatus moves, till the ſpring, the piſton, and the barrel, have entirely eſcaped from the caſe. When this is effected, all the reſt inſtantly follow, and the milty liquor which had been pumped in, and confined in the ſpongy ſubſtance, runs out through the barrel. According to this account, the milt of the calmar contains no animalcules; and therefore we may from analogy conclude, that the ſmall moving bodies which are to be ſeen in the ſemen of other animalcules, are not really creatures endowed with life. Mr. Buffon extends the analogy ſtill further; and concludes, that all the moving bodies which are to be found in the infuſions either of animal or vegetable ſubſtances are of a ſimilar nature. "To diſcover, ſays he, whether all the parts of animals, and all the ſeeds of plants, contained moving organic particles, I made infuſions of the fleſh of different animals, and of the ſeeds of more than 20 different ſpecies of vegetables; and after remaining ſome days in cloſe glaſſes, I had the pleaſure of ſeeing organic moving particles in all of them. In ſome they appeared ſooner, in others later; ſome preſerved their motions for months, and others ſoon loſt it. Some at firſt produced large moving globules reſembling animals, which changed their figure, ſplit, and became gradually ſmaller. Others produced only ſmall globules, whoſe motions were extremely rapid; and others produced filaments, which grew longer, ſeemed to vegetate, and then ſwelled and poured forth torrents of moving globules." This laſt obſervation gave riſe to a new ſyſtem. Baron Munchauſen, perceiving that the laſt mentioned moving globules, after moving for ſome time, began again to vegetate, concluded that they were firſt *animals* and then *plants*!—This ſtrange hypotheſis Mr. Ellis has overturned in a paper publiſhed in the Philoſophical Tranſactions, vol. LIX. in which he aſſerts, that they are no other than the ſeeds of that genus of fungi called *mucor* or *mouldineſs*, and that their motion is owing to numbers of minute animalcules attacking them for food. "Having (ſays he) at the requeſt of Dr. Linnæus, made ſeveral experiments on the infuſion of muſhrooms in water, in order to prove the theory of Boron Munchauſen, that their ſeeds are firſt animals, and then plants, (which he takes notice of in his Syſtem of Nature, p. 1326, under the genus of chaos, by the name of *chaos fungorum ſeminum*) it appeared evidently, that the ſeeds were put into motion by very minute animalcules, which proceeded from the putrefaction of the muſhrooms: for, by pecking at their ſeeds, which are reddiſh, light, round bodies, they moved them about with great agility in a variety of directions; while the little animals themſelves were ſcarce viſible, till the food they had eaten diſcovered them. The ſatisfaction I received from clearing up this point, led me into many other curious intereſting experiments. The ingenious Mr. Needham ſuppoſes theſe little tranſparent ramified filaments, and jointed or corolloid bodies, which the microſcope diſcovers to us on the ſurface of moſt animal and vegetable infuſions when they become putrid, to be zoophytes, or branched animals: but to me they appear, after a careful ſcrutiny with the beſt glaſſes, to be of that genus of fungi called *mucor* or *mouldineſs*; many of which Michelius has figured, and Linnæus has accurately deſcribed. Their vegitation is ſo amazingly quick, that they may be perceived in the microſcope even to grow and feed under the eye of the obſerver. Mr. Needham has pointed out to us a ſpecies that is very remarkable for its parts of fructification. This, he ſays, proceeded from an infuſion of bruiſed wheat. I have ſeen the ſame ſpecies ariſe from the body of a dead fly, which was become putrid by lying floating for ſome time in a glaſs of water, where ſome flowers had been in the month of Auguſt 1768. This ſpecies of mucor ſends forth a maſs of tranſparent filamentous roots; from whence ariſe hollow ſtems, that ſupport little oblong oval ſeed veſſels, with a hole on the top of each. From theſe I could plainly ſee minute globular ſeeds iſſue forth in great abundance with an elaſtic force, and turn about in the water as if they were animated. Continuing to view them with ſome attention, I could juſt diſcover, that the putrid water which ſurrounded them was full of the minuteſt animalcula; and that theſe little creatures began to attack the ſeeds of the mucor for food, as I have obſerved before in the experiment on the ſeeds of the larger kind of fungi or muſhrooms. This new motion continued the appearance of their being alive for ſome time longer: but, ſoon after, many of them aroſe to the ſurface of the water, remaining there without motion; and a ſucceſſion of them afterwards coming up, they united together in little thin maſſes, and floated to the edge of the water, remaining there quite inactive during the time of obſervation. As this diſcovery cleared up many doubts which I had received from reading Mr. Needham's learned diſſertation, I put into the glaſs ſeveral other dead flies, by which means this ſpecies of mucor was propagated ſo plentifully, as to give me an opportunity of frequently trying the ſame experiment to my full ſatisfaction. Laſtly, Theſe jointed coralloid bodies, which Mr. Needham calls *chaplets* and *pearl necklaces*, I have ſeen frequently very diſtinctly. Theſe appear not only on an infuſion of bruiſed wheat when it becomes putrid, but on moſt other bodies when they throw up a viſcid ſcum and are in a ſtate of putrefaction. Theſe, then, are evidently no more than the moſt common mucor, the ſeeds of which are every where floating in the air; and bodies in this ſtate afford them a natural proper ſoil to grow upon. Here they ſend downwards their fine traſparent ramified roots into the moiſture which they float upon; and from the upper part of the ſcum, their jointed coralloid branches riſe full of ſeed into little glove-like figures. When a ſmall portion of theſe branches and ſeeds are put into a drop of the ſame putrid water upon which the ſcum floats, many of theſe millions of little animalcula with which it abounds, immediately ſeize them as food, and turn them about with a variety of motions, as in the experiments on the ſeeds of the common muſhrooms, either ſingly, or two or three ſides connected together; anſwering exactly to Mr. Needham's deſcription, but evidently without any motion of their own, and conſequently not animated." The Count de Buffon, however, is not content with denying life only to thoſe beings where the ſigns of it are the moſt equivocal; but includes in the ſame rank of organic particles, almoſt every animal too ſmall to be diſcovered by the naked eye, and even ſome of thoſe whoſe motions are evidently perceptible to the eye. "Almoſt all microſcopic animals, (ſays he) are of the ſame nature with the moving bodies in the ſeminal fluids and infuſions of animal and vegetable ſubſtances. The eels in paſte, in vinegar, &c. are all of the ſame nature, and derived from the ſame origin. There are, perhaps, as many beings that either live or vegetate, produced by a fortuitous aſſemblage of organic particles, as by a conſtant and ſucceſſive generation. Some of them, as thoſe of the calmar, are only a kind of machines, which, though exceedingly ſimple, are very active. Others, the ſpermatic animalcules, ſeem to imitate the movements of animals. Others reſemble vegetables in their manner of growth and extenſion. There are others, as thoſe of blighted wheat, which at pleaſure can be made alternately either to live or die, and it is difficult to know to what they ſhould be compared. There are ſtill others, and in great numbers, which are at firſt a kind of animals, then become a ſpecies of vegetables, and again return alternately to their vegetable ſtate. The eels in paſte have no other organ than the union of the organic particles of the eſſential part of the grain. The firſt eels that appear are certainly not produced by other eels; but though they are not propagaged themſelves, they fail not to engender other living eels. By cutting them with the point of a lancet, we diſcover ſmaller eels iſſuing in great numbers out of their bodies. The body of this animal ſeems to be only a ſheath or ſac, containing a multitude of ſmaller animals, which perhaps are other ſheaths of the ſame kind, in which the organic matter is aſſimilated into the form of eels."—But though we can by no means pretend to account for the appearance of theſe animalcules, yet we cannot help obſerving, that our ignorance of the cauſe of any phenomenon is no argument againſt its exiſtence. Though we are not able to account in a ſatisfactory manner, for the origin of the native American, we ſuppoſe Buffon himſelf would reckon it abſurd to maintain, that the Spaniards, on their arrival there, found only *organic particles* moving about in diſorder. The caſe is the ſame with the eels in paſte. They are exceedingly minute, in compariſon with us; but, with the ſolar microſcope, Mr. Baker has made them aſſume a more reſpectable appearance, ſo as to have a diameter of an inch and an half, or two inches, and a length proportionable. They ſwarm up and down, very briſkly; the motion of their inteſtines was plainly viſible; when the water dried up, they died with apparent agonies, and their mouths gaped very wide. Were we to find a creature of the ſize of this magnified eel, gaſping in a place where water had lately been, we certainly would never conclude it to be an *organic particle*, or a fortuitous aſſemblage of them, but a fiſh. Why then ſhould we conclude otherwiſe, with regard to the eel while in its natural ſtate, than that it is a little fiſh? In reaſoning on this ſubject, we ought always to remember, that, however eſſential the diſtinction of bodies [illegible] great and ſmall, may appear to us, they are not ſo to th[illegible] with whom, as Mr. Baker well expreſſes [illegible] atom is as a world, and a world but as an at[illegible] the Deity to exert his power for a little, [illegible] philoſopher a view of a quantity of paſte, [illegible] from each of whoſe bodies the light was [illegible] it paſſes through a ſolar microſcope; [illegible] them organic particles, the paſte w[illegible] mountain, he would probably lo[illegible] monſtrous aſſemblage of ſerpents, [illegible] near them. Wherever, therefore, [illegible] appearance, endued with the princi[illegible] or whaever elſe we make the chara[illegible] ther the ſmallneſs of their ſize, nor the [illegible] knowing how they come there, o[illegible] their being really animated.—A[illegible] alſo be remembered, that *motion* is [illegible] iſtic of animal life, even though [illegible] avoid one another, or any ſeeming [illegible] way. We know, that inanimate bodies, [illegible] will avoid others, endowed with an e[illegible] kind, and adhere to thoſe which have t[illegible] we are by no means acquainted with [illegible] electricity, but on the contrary, from [illegible] it, have all the reaſon in the world, to conc[illegible] can produce effects, utterly beyond our c[illegible] impoſſible for us to know what ſhare it [illegible] ducing the motions obſerved in vegetable an[illegible] the ſemen of animals. We may alſo further o[illegible] though in Mr. Ellis's experiment of the boiled [illegible] took it for granted, that every ſeed of animal life [illegible] deſtroyed by the boiling water, yet even this [illegible] proved; nay, on the contrary, it hath be[illegible] deniable experiments, that the human body [illegible] dured a heat of 240 degrees of Fahrenheit, ([illegible] above that of boiling water) without injury. Th[illegible] theſe animalcula might therefore be ſtrong en[illegible] the heat hitherto uſed in Mr. Ellis's or any [illegible] ment. A conſiderable objection to the exi[illegible] malcules in the ſemen, or any other part of [illegible] ariſes from the total excluſion of air, which is [illegible] ceſſary to the life of larger animals. Some ever, have been obſerved of toads, ſhell fiſh, and other large animals being found in ſuch ſituations, as they could not poſſibly have enjoyed the leaſt benefit from the air, for a great number of years; and yet, in this ſtate, they have not only lived, but lived much longer than they would otherwiſe have done. See BUFO, and DACTYLUS. Upon the whole, therefore, though philoſophers are not yet able to diſcover how theſe minute creatures are produced; yet, that there really are animals much ſmaller than what we can diſcern with our naked eye, ſeems to be indiſputable. This ſubject, however, is ſtill evidently obſcure, and will no doubt require the utmoſt attention of philoſphers, as well as further improvements in the conſtruction of microſcopes, fully to inveſtigate it. See MICROSCOPE.

Animalcules are ſaid to be the cauſe of various diſorders. The itch, from ſeveral experiments, is found to be a diſorder ariſing from the irritations of a ſpecies of animalcula, in the puſtules of that ailment; whence the communication of it by contact, is eaſily conceived, as alſo the reaſon of the cure being effected by cutaneous applications. On this foundation, ſome have attributed the ſmall pox, meaſles, and infectious diſeaſes; others the epilepſy, &c. to animalcules. Langius goes farther, and pretends to reduce all diſeaſes in general, to the ſame principle. A late writer in the *Journal des Scavans,* (tom. lxxxii.) at Paris, who aſſumed the title of an Engliſh phyſician, has done more. He not only accounts for all diſeaſes, but for the operation of all medicines, from the hypotheſis of animalcules! He has peculiar animals for every diſeaſe; ſcorbutic animalcules, padagrical animalcules, variolous animalcules, &c. all at his ſervice. But, as moſt diſcoveries in natural philoſophy, have laid a foundation for the warm imaginations of ſome men, to form viſionary theories, to the great prejudice of real knowledge; ſo thoſe relating to animalcula, have been drawn in, however improperly, to ſupport the moſt whimſical and chimerical ſyſtems.

ANIMALITY, *n. s.* the ſtate of animal exiſtence.

ANIMATE, *adj.* alive; poſſeſſing animal life.

To **ANIMATE,** *v. a.* 1. To quicken; to make alive.—2. To heighten the powers, or effect of any thing.—3. To encourage; to incite.

ANIMATED, *part. adj.* lively; vigorous.—Animated alſo denotes a thing impregnated with vermin or animalcules. In this ſenſe, the whole earth ſeems to be animated; for, in every part of it, we meet with an infinite number of animals, either viſible or inviſible; they are found in air water, earth, plants, and even in the hardeſt ſtones: and there is perhaps, no animal known, which does not breed numbers of others in the different parts of its body.

ANIMATED MERCURY, among chemiſts, quick-ſilver, impregnated with ſome ſubtle and ſpiritous particles, ſo as to render it capable of growing hot, when mingled with gold.

ANIMATED NEEDLE, a needle touched with the loadſtone.

ANIMATENESS, *n. s.* the ſtate of being animated.

ANIMATION, *n. s.* 1. The act of animating or enlivening.—2. The ſtate of being enlivened.

ANIMATIVE, *adj.* that which has the power of giving life, or animating.

ANIMATOR, *n. s.* that which gives life: or any thing analogous to life, as motion.

ANIMI DELIQUIUM, ſwooning. See LYPOTHYMIA.

ANIMOSITY, *n. s.* vehemence of hatred; paſſionate malignity.

ANISATA AQUA, aniſe-ſeed water. See ANISE-SEED.

ANISATUM SACCHARUM, ſugar of aniſe. It is a good carminative for children, when troubled with flatulence, gripes, &c.

ANISE, *n. s.* a ſpecies of apium, or parſley, with large ſweet ſcented ſeeds.

ANISE-SEED, a medicinal ſeed produced by the plant aniſe, and containing an eſſential oil. It is carminative, expelling wind out of the ſtomach and bowels, both given at the mouth, and in clyſters. It is frequently put into children's victuals for the gripes and wind. It is uſeful againſt cold affections of the lungs, difficulty of breathing, and aſthma. Some recommend it to be taken frequently by nurſes to increaſe their milk. It is often uſed as a corrector of the ſtronger purgatives. The oil diſtilled from the ſeed is uſed for the ſame purpoſes; and is often applied outwardly in carminative and anodyne liniments; particularly for the pleuriſy and other pains in the ſide. In diſtilling the aniſe-ſeed for the oil, there is procured aniſe-ſeed water; which has much the ſame virtues with the oil.

ANKLE, the joint which joins the foot to the leg.

ANKLE-BONE, *n. s.* the bone of the ankle.

ANKLE, LUXATIONS, &c. OF THE. The ankle is ſubject to be luxated, either in running, in jumping, or even in walking; and that in all four directions, either inward or outward, backward or forward. When the ankle is luxated inward, the bottom of the foot is turned outward; and, on the contrary, when it is luxated outward, the bottom of the foot is turned inward, which latter caſe is indeed much more frequent than the others. If it is diſlocated forward, the heel becomes ſhorter, and the foot longer than it ſhould be; and if backward, the contrary ſigns to theſe will appear. The ankle, however, can ſcarce poſſibly be luxated outward, unleſs the *fibula* be ſeparated from the *tibia,* or elſe quite broken, which may happen to the outward ankle; nor is it uncommon for luxations of the ankle to be attended with very grievous ſymptoms, eſpecially when occaſioned by ſome great external violence. Nor can it indeed well happen otherwiſe in this caſe, ſince the diſtinction of the foot muſt neceſſarily overſtrain the adjacent tendons, ligaments, and nerves, and thence excite very violent pains, and other bad ſymptoms: or the veins and arteries may alſo very eaſily be lacerated, which will occaſion a large extravaſation of blood about the whole foot, and too often give riſe to a gangrene. It is however, neceſſary to obſerve, that the ankle is not always luxated, after it has been violently ſtrained by leaping, or turning the foot on one ſide; for it ſometimes happens that the ankle is not diſlocated on theſe occaſions, but only the parts violently contuſed and ſtrained. The ankle, when truly luxated, is more or leſs difficult to be reduced according to the violence of the force by which the accident was occaſioned. The moſt ready way, however, of reducing a luxation of the ankle, is to place the patient upon a bed, ſeat, or table, letting the leg and foot be extended in oppoſite directions by two aſſiſtants, while the ſurgeon replaces the bones with his hands and fingers in their proj [illegible] ſitua [illegible]. When the foot is by this means reſtored to its [illegible] it is to be well bathed with oxycrate and ſalt, and then carefully bound up with a proper bandage. The patient muſt be enjoined to keep his bed for a conſiderable time, till the bad ſymptoms are gone, and the ankle has recovered its ſtrength ſo far as to bear the weight of the body, without any uneaſineſs or danger. We have an account of the menſes regularly evacuated at an ulcer of the ankle, in the Edinburgh Medical Eſſays, vol. iii. art. 29.

ANNALIST, *n. s.* a writer of annals.

ANNALS, *n. s.* hiſtories digeſted in the exact order of time: narratives in which every event is recorded under its proper year.

ANNAPOLIS, the capital of the State of Maryland, is ſituated in Cape Arundel county, at the mouth of the river *Severn*, by which name the city was likewiſe called, till the year 1695, when by an act of the legiſlature, it was made the reſidence of a collector and naval officer, and received its preſent name. It was incorporated in the year 1708, and is governed by a mayor, recorder, ſix aldermen, and ten common council men. This city is of little note in the commercial world: but is the wealthieſt town of its ſize in the United States. The houſes are about 320 in number, and in general elegant and built of brick. The State Houſe, which ſtands on an eminence, in the centre, from which point the ſtreets diverge in every direction, like radii, commands a pleaſant and extenſive view of the bay and Eaſtern ſhore, and is perhaps the moſt elegant building of the kind in the United States. The other public buildings are, a college, an epiſcopal, and a methodiſt church, and a ſmall theatre. The college, which has at preſent about an hundred ſtudents, and is daily encreaſing in reputation, was incorporated in the year 1784, and is endowed with very liberal funds for its ſupport. Annapolis is 30 miles S. of Baltimore, 32 E. by N. of the city Waſhington, and 132 S. W. from Philadelphia. Lat. 38. 56. N. Lon. 1. 30. W.

ANNAPOLIS ROYAL, formerly the capital of Nova-Scotia, is the chief town of the county of the ſame name, and ſtands on the S. ſide of the river and bay of Annapolis. It has one of the fineſt harbours in America, capable of containing ſeveral hundred large veſſels at anchor, in the utmoſt ſecurity. Its entrance is, however, very difficult, and only one veſſel can paſs at a time. Since it has ceaſed to be the metropolis of the province, its trade has become very inconſiderable. Lat. 45. 10. N. Lon. 11. 55. E.

To ANNEAL, *v. a.* 1. To heat glaſs that the colours laid on it may pierce through.—2. To heat any thing in ſuch a manner as to give it the true temper.

To ANNEX *v. a.* 1. To unite to at the end.—2. To unite.

ANNEXATION, *n. s.* 1. Conjunction; addition.—2. Union.

ANNEXION, *n. s.* the act of annexing; addition.

ANNEXMENT, *n. s.* 1. The act of annexing.—2. The thing annexed.

ANNIHILABLE, *adj.* that which may be reduced to nothing.

To ANNIHILATE, *v. a.* 1. To reduce to nothing.—2. To deſtroy.—3. To annul.

ANNIHILATION, *n. s.* the act of reducing to nothing.

ANNIVERSARY, *adj.* returning with the revolution of the year; annual; yearly.

ANNIVERSARY, *n. s.* 1. A day celebrated as it returns in the courſe of the year; thus the 4th of July is the anniverſary of American Independence.—2. The act of celebration, or performance, in honour of the anniverſary day.

ANNO DOMINI, in the year of our Lord; as, *anno domini*, or *A. D.* 1802; that is, in the one thouſand eight hundred and ſecond year from the birth of our Saviour.

ANNOTATION, *n. s.* explications or remarks written upon books; notes.

ANNOTATOR. *n. s.* a writer of notes or annotations; a ſcholiaſt; a commentator.

To ANNOUNCE, *v. a.* 1. To publiſh; to proclaim.—2. To pronounce; to declare by a judicial ſentence.

ANNOY, *n. s.* injury; moleſtation; trouble.

To ANNOY, *v. a.* to incommode; to vex; to teaze; to moleſt.

ANNOYANCE, *n. s.* 1. That which annoys; that which hurts.—2. The ſtate of being annoyed, or act of annoying.

ANNOYER, *n. s.* the perſon that annoys.

ANNUAL, *adj.* 1. That which comes yearly.—2. That which is reckoned by the year.—3. That which laſts only a year.

ANNUALLY, *adv.* yearly; every year.

ANNUITANT, *n. s.* he who poſſeſſes or receives an annuity.

ANNUITIES imply any periodical income, ariſing from money lent, or from houſes, lands, ſalaries, penſions, &c. payable from time to time, either annually, or at other intervals of time.—Annuities may be divided into ſuch as are CERTAIN, and ſuch as depend on ſome CONTINGENCY, as the continuance of a life, &c. Annuities are alſo divided into annuities in POSSESSION, and annuities in REVERSION; the former meaning ſuch as have commenced; and the latter, ſuch as will not commence till ſome particular event has happened, or till ſome given period of time has elapſed. Annuities may be farther conſidered as payable either *yearly*, or *half yearly*, or *quarterly*, &c. The doctrine of annuities conſtitutes a branch of practical arithmetic; for which reaſon, we ſhall poſtpone the ſcientific treatment of that ſubject, till we come to the head ARITHMETIC, which ſee.

Borrowing upon annuities is one of the methods which has been frequently employed by European governments, for raiſing ſupplies. Of this there are two methods; that of borrowing upon annuities for terms of years, and that of borrowing upon annuities for lives. During the reigns of king William and queen Anne, large ſums were frequently borrowed in Great-Britain, upon annuities for terms of years, which were ſometimes longer and ſometimes ſhorter. In 1693, an act was paſſed for borrowing one million upon an annuity of 14 *per cent.* or of 140,000l. a year for 16 years. In 1691, an act was paſſed for borrowing a million upon annuities for lives, upon terms which in the preſent times would appear very advantageous. But the ſubſcription was not filled up. In the following year the deficiency was made good by borrowing upon annuities for lives at 14 *per cent.* or at little more than ſeven years purchaſe. In 1695, the perſons, who had purchaſed thoſe annuities were allowed to exchange them for others of 96 years, upon paying into the exchequer 63 pounds in the hundred; that is, the difference between 14 *per cent.* for life, and 14 *per cent.* for 96 years, was ſold for 63 pounds, or for four and a half years purchaſe. Such was the ſuppoſed inſtability of government, that even theſe terms procured few purchaſers. In the reign of queen Anne, money was upon different occaſions borrowed both upon annuities for lives and upon annuities for terms of 32, of 89, of 98, and of 99 years. In 1719, the proprietors of the annuities for 32 years were induced to accept in lieu of them South Sea ſtock to the amount of eleven and a half years purchaſe of the annuities, together with an additional quantity of ſtock equal to the arrears which happened then to be due upon them. In 1720, the greater part of the other annuities for terms of years, both long and ſhort, were ſubſcribed into the ſame fund. The long annuities at that time amounted to 666,821l. 8s. 3½d. a year. On the 5th of January, 1775, the remainder of them, or what was not ſubſcribed at that time, amounted only to 136,453l. 12s. 8d. During the two wars which began in 1739 and in 1755, little money was borrowed either upon annuities for terms of years, or upon thoſe for lives. An annuity for 98 or 99 years, however, is worth nearly as much money as a perpetuity, and ſhould, therefore, one might think, be a fund for borrowing nearly as much. But thoſe who, in order to make family ſettlements, and to provide for remote futurity, put into the public ſtocks, would not care to purchaſe into one of which the value was continually diminiſhing; and ſuch people make a very conſiderable proportion both of the proprietors and purchaſers of ſtock. An annuity for a long term of years, therefore, though its intrinſic value may be very nearly the ſame with that of a perpetual annuity, will not find nearly the ſame number of purchaſers. The ſubſcribers to a new loan, who mean generally to ſell their ſubſcription as ſoon as poſſible, prefer greatly a perpetual annuity redeemable by parliament, to an irredeemable annuity, for a long term of years of only equal amount. The value of the former may be ſuppoſed always the ſame, or very nearly the ſame; and it makes, therefore, a more convenient tranſferable ſtock than the latter. During the two laſt mentioned wars, annuities, either for terms of years or for lives, were ſeldom granted but as premiums to the ſubſcribers to a new loan, over and above the redeemable annuity or intereſt upon the credit of which the loan was ſuppoſed to be made. They were granted, not as the proper fund upon which the money was borrowed; but as one additional encouragement to the lender. Annuities for lives have occaſionally been granted in two different ways; either upon ſeparate lives, or upon lots of lives, which in French are called *Tontines*, from the name of their inventor. When annuities are granted upon ſeparate lives, the death of every individual annuitant diſburthens the public revenue ſo far as it was affected by his annuity. When annuities are granted upon tontines, the liberation of the public revenue does not commence till the death of all the annuitants comprehended in one lot, which may ſometimes conſiſt of twenty or thirty perſons, of whom the ſurvivors ſucceed to the annuities of all thoſe who die before them; the laſt ſurvivor ſucceeding to the annuities of the whole lot. Upon the ſame revenue more money can be raiſed by tontines, than by annuities for ſeparate lives. An annuity, with a right of ſurvivorſhip, is really worth more than an equal annuity for a ſeparate life, and from the confidence which every man naturally has in his own good fortune, the principle upon which is founded the ſucceſs of all lotteries, ſuch an annuity generally ſells for ſomething more than it is worth. In countries where it is uſual for government to raiſe money by granting annuities, tontines are upon this account generally preferred to annuities for ſeparate lives. The expedient which will raiſe moſt money, is almoſt always perferred to that which is likely to bring about in the ſpeedieſt manner the liberation of the public revenue. In France, before the late revolution, a much greater proportion of the public debt conſiſted in annuities for lives than in England. According to a memoir preſented by the parliament of Bourdeaux to the king in 1764, the whole public debt of France was eſtimated at 2400 millions of livres; of which the capital, (for which annuities for lives has been granted,) was ſuppoſed to amount to 300 millions, the 8th part of the whole public debt. The annuities themſelves were computed to amount to 30 millions a year, the 4th part of 120 millions, the ſuppoſed intereſt of that whole debt. It was not the different degrees of anxiety in the two governments of France and England for the liberation of the public revenue, which occaſioned this difference in their reſpective modes of borrowing; it aroſe altogether from the different views and intereſts of the lenders. In the former, the money lenders were, in general, either court bankers, farmers general, or tax gatherers, who, from a mean origin, had roſe to great riches, and who, being too proud to marry their equals or inferiors, were deſpiſed by thoſe haughty nobleſſe, who conſidered themſelves as their ſuperiors; and therefore reſolved to live bachelors. To ſuch perſons, who had no proſpect of, or care for poſterity, nothing was more convenient than to exchange their capital for a revenue, that would laſt juſt as long and no longer than they wiſhed. But in Britain, the ſeat of government being in the greateſt mercantile city in the world, the merchants are generally the people who advance money to government. By advancing it they do not mean to diminiſh, but, on the contrary, to increaſe their mercantile capitals; and unleſs they expected to ſell with ſome profit their ſhare in the ſubſcription for a new loan, they never would ſubſcribe. But if by advancing their money they were to purchaſe, inſtead of perpetual annuities, annuities for lives only, whether their own or thoſe of other people, they would not always be ſo likely to ſell them with a profit. Annuities upon their own lives they would always ſell with loſs; becauſe no man will give for an annuity upon the life of another whoſe age and ſtate are nearly the ſame with his own, the ſame price which he would give for one upon his own. An annuity upon the life of a third perſon, indeed, is, no doubt, of equal value to the buyer and the ſeller; but its real value begins to diminiſh from the moment it is granted, and continues to do ſo more and more as long as it ſubſiſts. It can never, therefore, make ſo convenient a transferable ſtock as a perpetual annuity, of which the real value may be ſuppoſed always the ſame, or very nearly the ſame.

ANNUITY, *n. s.* 1. A yearly rent to be paid for a term of life or years.—2. A yearly allowance.

To ANNUL, *v. a.* 1. To make void; to nullify.—2. To reduce to nothing.

ANNULAR, *adj.* in the form of a ring.

ANNULARY, *adj.* in the form of ringlets.

ANNULET, *n. s.* a little ring.

ANNULETS, in architecture, are ſmall ſquare members, in Doric capital, placed under the quarter round. They are called *fillets*.

To ANNUMERATE, *v. a.* to add to a former number.

ANNUMERATION, *n. s.* addition to a former number.

To ANNUNCIATE, *v. a.* to bring tidings.

ANNUNCIATION-DAY, *n. s.* a feaſt celebrated by the church on the 25th of March, in commemoration of the tidings which the angel Gabriel brought to the Virgin Mary, informing her of the incarnation of our Saviour.

ANODYNE, *adj.* a term applied to medicines which eaſe pain and procure ſleep. They are divided into three ſorts, viz. 1. Paregorics, or ſuch as aſſuage pain. 2. Hypnotics, or ſuch as relieve by procuring ſleep. 3. Narcotics, or ſuch as eaſe the patient by ſtupifying him. Opiates and narcotics taken too frequently diminiſh ſenſation: in large doſes they deſtroy life. In particular diſeaſes, and in proper doſes, they are excellent medicines. Some hypnotics and paregorics, as nitre, camphor, &c. procure eaſe and ſleep by removing the offending cauſe. Camphor is ſaid to be the beſt anodyne in nervous caſes and at the decline of fevers. But opium properly adminiſtered is the beſt of anodynes, excepting in caſes where coſtiveneſs, a full habit, or the like, prohibit the uſe of it. The doſes of all theſe medicines are generally regulated by the pulſe. Anodynes ſhould be given with great caution, and not on a full ſtomach, nor in dropſies. Hemlock procures eaſe and ſleep, without cauſing that head-ach next morning, uſually complained of after taking opium. Certain compound medicines are alſo prepared with this intention. Such is the anodyne balſam, made of caſtile ſoap, camphor, ſaffron, and ſpirit of wine, digeſted in a ſand heat. It is recommended not only for procuring eaſe, in the moſt excruciating pains, but alſo for aſſiſting in diſcharging the peccant matters which occaſioned it. This balſam is much the ſame with the modern opodeldoc. A ready way of preparing a uſeful ſafe, and efficacious anodyne, is as follows: take half an ounce of opium, diſſolve it in a gentle heat in three ounces of water, ſtrain the ſolution, and evaporate it to a dry ſubſtance. Grind this to powder in a glaſs mortar with twice the quantity of loaf ſugar, and of this preparation three or four grains may be given for a doſe. By diſſolving the opium thus in water, we get rid, not only of its groſs parts, but alſo of its reſinous, which are found more pernicious than the reſt; and by dividing it afterwards with ſugar, the medicine is rendered more uniform, ſoluble, and miſcible with animal fluids.

To ANOINT, *v. a.* 1. To rub over with unctuous matter, as oil, or unguents.—2. To ſmear; to be rubbed upon. —3. To conſecrate by unction.

ANOINTER, *n. s.* the perſon who anoints.

ANOMALOUS, *adj.* irregular; ſomething which deviates from the ordinary rule and method of other things of the ſame kind.

ANOMALOUS VERBS, in grammar, ſuch as are not conjugated conformably to the paradigma of their conjugation. They are found in all languages. In Engliſh the irregularity relates often to the preterite tenſe and paſſive participle: for example, *give*, were it formed according to rule, would make *gived* in the preterite tenſe and paſſive participle; whereas, in the former, it makes *gave*, and in the latter *given*. See GRAMMAR.

ANOMALOUSLY, *adv.* irregularly; in a manner contrary to rule.

ANOMALY, *n. s.* irregularity; deviation from the common rule.

ANOMY, *n. s.* breach of law.

ANON, *adv.* 1. Quickly; ſoon; in a ſhort time.—2. Now and then.

ANONYMOUS, *adj.* wanting a name.

ANONYMOUSLY, *adv.* without a name.

ANOREXY, *n. s.* inappetency, or loathing of food.—Anorexy is either original or ſymptomatic. When it is original its cauſes are, bad diet, too free drinking, voraciouſneſs, &c. In which caſes, a vomit of ipecacuanha may be taken; after which temperance, a light but cordial nouriſhing diet, and daily exerciſe, perſiſted in, will generally effect a recovery. But it is more frequently a ſymptom of ſome other diſorder; and then the cure depends on the removal of the original one.

ANOTHER, *adj.* 1. Not the ſame.—2. One more.—3. Any other.—4. Not one's ſelf.—5. Widely different.

ANSER, in ornithology, a ſpecies of anas. See ANAS.

ANSERES, the name which Linnæus gives to his third order of birds. See ZOOLOGY.

ANSWER, *n. s.* 1. That which is ſaid, in return to a queſtion, or poſition.—2. A confutation of a charge exhibited againſt a perſon.

To ANSWER, *v. n.* 1. To ſpeak in return to a queſtion.—2. To ſpeak in oppoſition.—3. To be accountable for.—4. To vindicate; to give a juſtificatory account of.—5. To give an account.—6. To correſpond to; to ſuit with.—7. To be equivalent to.—8. To ſatisfy any claim or petition. —9. To act reciprocally.—10. To ſtand as oppoſite or correlative to ſomething elſe.—11. To bear proportion to.—12. To perform what is endeavoured or intended by the agent. 13. To comply with.—14. To proceed; to produce the wiſhed event.—15. To appear to any call, or authoritative ſummons.—16. To be over againſt any thing.

ANSWERABLE, *adj.* 1. That to which a *reply* may be made.—2 Obliged to give an account.—3. Correſpondent. —4. Proportionate.—5. Suitable.—6. Equal.—7. Relative.

ANSWERABLY, *adv.* in due proportion; with proper correſpondence; ſuitably.

ANSWERER, *n. s.* he who ſpeaks in return to what another has ſpoken or written.

ANT, *n. s.* an emmet; a piſmire. For a deſcription of this extraordinary genus of inſects, ſee the article FORMICA.

ANT-BEAR, or ANT-EATER, in zoology. See MYRMECOPHAGA.

ANT-HILL, or HILLOCK, *n. s.* the ſmall protuberances of earth in which ants make their neſts. They do a great deal of miſchief to dry paſtures, not only by waſting ſo much land as they cover, but by hindering the ſcythe in mowing the graſs, and yielding a poor hungry food pernicious to cattle. The manner of deſtroying them is to cut them into four parts from the top, and then dig into them ſo deep as to take out the core below, ſo that when the turf is laid down again, it may lie ſomewhat lower than the level of the reſt of the land: by this means it will be wetter than the reſt of the land; and this will prevent the ants from returning to the ſame place, which otherwiſe they would certainly do. The earth that is taken out muſt be ſcattered to as great a diſtance every way as may be, otherwiſe they will collect it together and make another hill juſt by. The proper time for doing this is winter; and if the places be left open, the froſt and rains of that time of the year will deſtroy the reſt: but in this caſe care muſt be taken that they are covered up early enough in the ſpring, otherwiſe they will be leſs fertile in graſs than the other places. In ſome places of England they uſe a particular kind of ſpade for this purpoſe. It is very ſharp, and formed at the top into the ſhape of a creſcent, ſo that the whole edge makes up more than three-fourths of a circle; this cuts in every part, and does the buſineſs very quickly and effectually. Others uſe the ſame inſtruments that they do for mole-hills. Human dung, however, is a better remedy than all theſe, as is proved by experiment; for it will kill great numbers of them, and drive all the reſt away, if only a ſmall quantity of it be put into their hills. Unſlacked lime has alſo been uſed ſucceſsfully.

ANTS, ACID OF. See ACID OF ANTS.

ANTS EGGS, a kind of little white balls found in the neſts of ants, ordinarily ſuppoſed to be the ova of this inſect. Late naturaliſts have obſerved, that theſe are not properly the ants eggs, but the young brood themſelves in their firſt ſtate; they are ſo many little vermiculi wrapped up in a film or ſkin, compoſed of a ſort of ſilk, which they ſpin out of themſelves as ſilk-worms and catterpillars do. At firſt they are hardly obſerved to ſtir: but, after a few days continuance, they exhibit a feeble motion of flexion and extenſion; and begin to look yellowiſh and hairy, ſhaped like ſmall maggots, in which ſhape they grow up till they are almoſt as large as ants. When they paſs their metamorphoſis, and appear in their proper ſhape, they have a ſmall black ſpeck on them cloſe to the anus of the included ant, which M. Lewenhoek probably enough imagines to be the feces voided by it. Sir Ed. King, M. D. opened ſeveral of theſe vulgarly reputed eggs; in ſome of which he found only a maggot in the circumſtances above deſcribed; while in another the maggot had begun to put on the ſhape of an ant about the head, having two little yellow ſpecks, where the eyes were to be. In others, a further progreſs was obſerved, the included maggots being furniſhed with every thing to complete the ſhape of an ant, but wholly tranſparent, the eyes only excepted, which were as black as bugles.—Laſtly, in others, he took out ants every way perfect and complete, which immediately crept about among the reſt. Theſe ſuppoſed ants eggs are brought up every morning in ſummer, near the top of the neſt, where they are lodged all the influence. At night, or if it be cool, or like to rain, they carry them down to a greater depth; ſo that you may dig a foot depth e'er you come at them. The true ants eggs are the white ſubſtance, which upon opening their banks, appears to the eye like the ſcatterings of fine white ſugar, or ſalt, but very ſoft and tender. Examined by a microſcope, it is found to conſiſt of ſeveral pure, white appearances, in diſtinct membranes, all figured like the leſſer ſorts of birds eggs, and as clear as the bladder of a fiſh. The ſame ſubſtance is found in the bodies of the ants themſelves. On this ſpawn, when emitted, they lie in multitudes, to brood, till it is turned into little vermicles as ſmall as mites, commonly called *ants eggs*.

ANTAGONIST, *n. s.* 1. One who contends with another; an opponent.—2. Contrary.

ANTAGONIST MUSCLES, in anatomy, thoſe which have oppoſite functions: as flexors and extenſors, abductors and adductors, &c.

To ANTAGONIZE, *v. a.* to contend againſt another.

ANTALGIC, *adj.* that which ſoftens pain; anodyne.

ANTAPOPLECTIC, *adj.* good againſt an appoplexy.

ANTARCTIC, *adj.* the ſouthern pole, ſo called, as oppoſite to the northern. The ſtars near the antarctic pole never appear in our horizon.

ANTARCTIC CIRCLE is one of the leſſer circles of the ſphere, parallel to the equator, at the diſtance of 23°. 30'. from the ſouth pole. It takes its name from being oppoſite to another circle, parallel likewiſe to the equator, and at the ſame diſtance from the north pole, called the ARCTIC CIRCLE. Within this circle is comprehended the ſouth frigid zone, and it is the northern boundary of the ſouthern frigid zone.

ANTE, a Latin particle ſignifying *before*, which is frequently uſed in compoſitions; as, *antediluvian*, before the flood; *antechamber*, a chamber leading into another apartment.

ANTECANIS, in aſtronomy, the conſtellation otherwiſe called *Canis minor*, or the Star *Procyon*.

To ANTECEDE, *v. n.* to precede; to go before.

ANTECEDENCE, *n. s.* the act or ſtate of going before; precedence.

ANTECEDENT, *adj.* going before; preceding.

ANTECEDENT, *n. s.* 1. That which goes before.—2. In grammar, the noun to which the relative is ſubjoined; as, the *man* who comes hither.—3. In logic, the firſt propoſition of an enthymene or argument, conſiſting only of two propoſitions.—Conditional or hypothetical propoſitions are thoſe whoſe parts are united by the conditional particle *if:* as, *if* the ſun be fixed, the earth muſt move: *if* there be no fire, there will be no ſmoke. The firſt part of theſe propoſitions, or that wherein the condition is contained, is called the *antecedent*, the other is called the *conſequent*.

ANTECEDENT, in mathematics is the firſt of two terms of a ratio, or that which is compared with the other. Thus if the ratio be *a : b*, or of *a* to *b*, *a* is ſaid to be the antecedent.

ANTECEDENT SIGNS, in medicine, are ſuch ſymptoms of diſorder as appear before a diſtemper is ſo formed as to be reducible to any particular claſs, or proper denomination.

ANTECEDENTS, in rhetoric, are ſuch propoſitions as being once allowed, others neceſſarily or very probably follow. This is one of the 16 topics, enumerated by Cicero and Quintilian.

ANTECEDENTLY, *adv.* previouſly.

ANTECESSOR, *n. s.* one who goes before, or leads another.

ANTECHAMBER, *n. s.* it is generally written, improperly, *antichamber*: the chamber that leads to the chief apartment.

ANTECURSOR, *n. s.* one who runs before.

ANTEDATE, among lawyers, a ſpurious or falſe date, prior to the true date of a bond, bill, or the like.

To ANTEDATE, *v. a.* 1. To date earlier than the real time, ſo as to confer a fictitious antiquity.—2. To take ſomething before the proper time.—

ANTEDILUVIAN, *adj.* 1. Exiſting before the deluge. 2. Relating to things before the deluge.

Antediluvian, *n. s.* one that lived before the flood.

Antediluvians, a general name for all mankind who lived before the flood, including the whole human race from the creation to the deluge. As Moſes has not ſet down the particular time of any tranſaction before the flood, except only the years of the fathers' ages, wherein the ſeveral deſcendants of Adam in the line of Seth were begotten, and the length of their ſeveral lives, chronologers have endeavoured to fix the years of the lives and deaths of thoſe patriarchs, and the diſtance of time from the creation to the deluge. In this there could be little difficulty were there no varieties in the ſeveral copies we now have of Moſes' writings, viz. the Hebrew, the Samaritan, and the Greek verſions of the Septuagint; but as theſe differ very conſiderably from one another, learned men are much divided in their opinions concerning the chronology of the firſt ages of the world; ſome preferring one copy, and ſome another.

Of the cuſtoms, policy, and other general circumſtances of the Antediluvians, we can only form conjectures. All that we know even of their religious rites, is, that they offered ſacrifices very early, both of the fruits of the earth, and of animals; but whether the fleſh and blood of the animals, or only their milk and wool were offered, is a diſputed point. Of their arts and ſciences, we have not much more to ſay. The Antediluvians ſeem to have ſpent their time rather in luxury and wantonneſs, to which the abundant fertility of the firſt earth invited them, than in diſcoveries or improvements, which probably they ſtood much leſs in need of, than their ſucceſſors. The art of working metals was found out by the laſt generation of Cain's line; and muſic, which they might be ſuppoſed to practice for their pleaſure, was not brought to any perfection, before the ſame generation. Some authors have ſuppoſed aſtronomy to have been cultivated by the Antediluvians, though this is probably owing to a miſtake of Joſephus: but it is to be preſumed, the progreſs they made therein, or in any other ſcience, was not extraordinary; it being even very doubtful, whether letters were ſo much as known before the flood. As to their politics and civil conſtitutions, we have not ſo much as one circumſtance whereon to build conjecture. It is probable the patriarchal form of government, which certainly was the firſt, was ſet aſide when tyranny and oppreſſion began to take place, and much ſooner among the race of Cain, than that of Seth. It ſeems alſo, that their communities were but few, and conſiſted of vaſtly larger numbers of people than any formed ſince the flood: or rather, it is a queſtion, whether, after the union of the two great families of Seth and Cain, there were any diſtinction of civil ſocieties, or diverſities of regular governments, at all. It is more likely, that all mankind then made but one great nation, though living in a kind of anarchy, divided into ſeveral diſorderly aſſociations; which, as it was almoſt the natural conſequence of their having, in all probability, but one common language, ſo it was a circumſtance which greatly contributed to that general corruption, which otherwiſe could not have ſo univerſally overſpread the Antediluvian world. And for this reaſon chiefly, as it ſeems, ſo ſoon as the poſterity of Noah were ſufficiently increaſed, a plurality of tongues was introduced in order to divide them into diſtinct ſocieties, and thereby prevent any ſuch total depravation for the future. See Confusion of tongues. Of the peaceful and happy ſtate of the Antediluvians, as well as of their virtuous and harmonious manner of life, Mr. Whithurſt, in his *Inquiry into the original State and Formation of the Earth*, has drawn a picture, ſimilar to that which the poets have given of the golden age. But our ingenious author, whoſe *Inquiry* is not profeſſedly repugnant to revelation, has forgotten to inform us, for what purpoſe, under ſuch circumſtances, the deluge was ſent; and, how we are to underſtand the account given by Moſes, who repreſents the Antediluvians, not as an innocent race, quietly repoſing on the ever-verdant turf; but as a corrupt generation, by whom "the earth was filled with violence." One of the moſt extraordinary circumſtances, which occurs in the Antediluvian hiſtory, is the vaſt length of human lives in thoſe firſt ages, in compariſon with our own. Few perſons now arrive to 80 or 100 years; whereas, before the flood, they frequently lived to near 1000; a diſproportion almoſt incredible, tho' ſupported by the joint teſtimonies of ſacred and profane writers. Some, to reconcile the matter with probability, have imagined, that the ages of theſe firſt men might poſſibly be computed, not by ſolar years, but months; an expedient which reduces the length of their lives rather to a ſhorter period than our own. But for this, there is not the leaſt foundation; beſides, the many abſurdities that would thence follow, ſuch as their begetting children at about ſix years of age, as ſome of them muſt have done, and the contraction of the whole interval between the creation and the deluge to conſiderably leſs than 200 years, even according to the larger computation of the Septuagint. Joſephus, and ſome Chriſtian divines, are of opinion, that before the flood, and ſome time after, mankind in general, did not live to ſuch a remarkable age, but only a few beloved of God, ſuch as the patriarchs mentioned by Moſes. *They reaſon* in this manner: Though the hiſtorian records the names of ſome men, whoſe longevity was ſingular, yet that is no proof that the reſt of mankind attained to that period of life, more than that every man was then of a gigantic ſtature, becauſe he ſays, *in those days there were giants upon the earth*. Beſides, had the whole of the Antediluvians lived ſo very long, and increaſed in numbers in proportion to their age, before the flood of Noah, the earth could not have contained its inhabitants, even ſuppoſing no part of it had been ſea. Hence they conclude, that God extended only the lives of the patriarchs, to ſuch an extraordinary length. But moſt writers maintain the longevity of mankind in general in the early world, not only upon the authority of ſacred, but likewiſe of profane hiſtory. And for ſuch a conſtitution, the moral reaſons are abundantly obvious. When the earth was wholly unpeopled, except by one pair, it was neceſſary to endow men with a ſtronger frame, and to allow them a longer continuance upon earth, for peopling it with inhabitants. In the infant ſtate of every mechanical art, relating to tillage, building, clothing, &c. it would require many years experience, to invent proper tools and inſtruments to eaſe men of their labour, and by multiplying eſſays and experiments to bring their inventions to any degree of maturity and perfection. Every part of their work muſt have been exceedingly arduous from ſuch a penury and coarſeneſs of tools, and muſt have required longer time, and more ſtrength of body than afterwards, when mechanical knowledge was introduced into the world. If parents at this period had not continued long with their children, to have taught them the art of providing for themſelves, and to defend themſelves from the attacks of wild beaſts, and from other injuries to which they were expoſed, many families would have been extinguiſhed. But one of the beſt and moſt valuable ends which longevity would anſwer, was, the tranſmitting of knowledge, particularly of religious knowledge to mankind. And thus, before writing was invented, or any ſuch eaſy and durable mode of conveyance was found out, a very few men ſerved for many generations to inſtruct their poſterity, who thus would not be at a loſs to conſult living and authentic records. The natural cauſes for this longevity are variouſly aſſigned. Some have imputed it to the ſobriety of the Antediluvians, and the ſimplicity of their diet; alledging, that they had none of thoſe provocations to gluttony, which wit and vice have ſince invented. Temperance might undoubtedly have ſome effect, but not poſſibly to ſuch a degree. There have been many temperate and abſtemious perſons in later ages, who yet ſeldom exceeded the uſual period. Others have thought, that the long lives of thoſe inhabitants of the old world proceeded from the ſtrength of their ſtamina, or firſt principles of their bodily conſtitutions, which might, indeed, be a concurrent, but not the ſole and adequate cauſe of their longevity; for Shem, who was born before the deluge, and had all the virtue of the Antediluvian conſtitution, fell 300 years ſhort of the age of his forefathers, becauſe the greateſt part of his life was paſſed after the flood. Others have imputed the longevity of the Antediluvians to the excellency of their fruits, and ſome peculiar virtue in the herbs and plants of thoſe days. But to this ſuppoſition, it has been objected, that as the earth was curſed, immediately after the fall, its productions, we may ſuppoſe, gradually decreaſed in their virtue and goodneſs, till the flood: and yet, we do not ſee the length of men's lives decreaſed conſiderably, if at all, during that interval. Waving this objection, as the import of the curſe is variouſly interpreted, it appears certain, that the productions of the earth, were at firſt, and probably continued, till after the deluge, of a different nature from what they were in future times. It has been farther ſuppoſed, that a principal cauſe of the longevity under conſideration was the wholeſome conſtitution of the Antediluvian air, which, after the deluge, became corrupted and unwholeſome, breaking by degrees, the priſtine craſis of the body, and ſhortening men's lives, in a very few ages, to near the preſent ſtandard. The temperature of the air and ſeaſons before that cataſtrophe are upon very probable grounds ſuppoſed to have been conſtantly uniform and mild: the burning heats of ſummer and the ſeverities of winter colds were not then come forth, but ſpring and autumn reigned perpetually together: And indeed, the circumſtance, above all others moſt conducive to the prolongation of human life in the poſtdiluvian world appears to be an equal and benign temperature of climate, (ſee LONGEVITY;) whence it ſeems reaſonable to infer, that the ſame cauſe might have produced the ſame effect in the Antediluvian world.

ANTEDILUVIANS, VAST PROBABLE NUMBERS OF. It is highly probable that the Antediluvian world was ſtocked with a much greater number of inhabitants than the preſent earth either actually does, or perhaps is capable of containing or ſupplying. This ſeems naturally to follow from the great length of their lives, which exceeding the preſent ſtandard of life in the proportion, at leaſt, of ten to one, the Antediluvians muſt accordingly, in any long ſpace of time, double themſelves, at leaſt in about the tenth part of the time in which mankind do now double themſelves. It has been ſuppoſed that they began to get children as early, and left off as late, in proportion, as men do now; and that the ſeveral children of the ſame father ſucceeded as quickly one after another as they uſually do at this day; and as many generations, which are but ſucceſſive with us, were cotemporary before the flood, the number of people living on the earth at once would be by that means ſufficiently increaſed to anſwer any defect which might ariſe from other circumſtances not conſidered. So that, if we make a computation on theſe principles, we ſhall find, that there was a conſiderable number of people in the world at the death of Abel, though their father Adam was not then 130 years old; and that the number of mankind before the deluge would eaſily amount to above one hundred thouſand millions (even according to the Samaritan chronology,) that is, to twenty times as many as our preſent earth can, in all probability, be well ſuppoſed capable of maintaining in its preſent conſtitution.

ANTEGO. See ANTIGUA.

ANTELOPE, *n. s.* in zoology, a genus of the goat kind, with curled or wreathed horns. See CAPRA.

ANTEMERIDIAN, *adj.* before noon.

ANTEMETIC, *adj.* that which has the power of preventing or ſtopping vomiting.

ANTEMUNDANE, *adj.* that which was before the creation of the world.

ANTENUMBER, *n. s.* the number that precedes another.

ANTENUPTIAL, *adj.* ſomething that precedes marriage; ſuch as antenuptial premiſes, antenuptial preſents, antenuptial covenants, antenuptial fornication, &c.

ANTEPENULT, *n. s.* the laſt ſyllable but two, as the ſyllable *te* in *antepenult;* a term of grammar.

ANTEPILEPTIC, *adj.* a medicine againſt convulſions. Antepileptics are chiefly the roots of pœony, valerian, the flowers of the lime tree, miſletoe of the oak, opium, muſk, camphor, æther, volatile alkali, and the aromatics in general.

ANTERIOR, *adj.* going before.

ANTES, *n. s.* pillars of large dimenſions that ſupport the front of a building.

ANTHELMINTHIC, *adj.* that which kills worms.—*Anthelminthics*, are things which are known by experience to kill them, as oils, or honey taken upon an empty ſtomach.

ANTHEM, *n. s.* a holy ſong; a ſong performed as part of divine ſervice.

ANTHEMIS, CAMOMILE: a genus of the polygamia ſuperflua order, belong to the ſyngeneſia claſs of plants. Of this genus Linnæus enumerates 17 ſpecies, of which the moſt remarkable are the two following: viz. the Nobilis, or common camomile, and the Pyrethrum, or pellitory of Spain. Theſe two ſpecies are uſed in medicine. The firſt have a ſtrong, not ungrateful, aromatic ſmell, and a very bitter nauſeous taſte. They are accounted carminative, aperient, emollient, and in ſome meaſure anodyne; and ſtand recommended in flatulent colics, for promoting the uterine purgations, in ſpaſmodic pains, and the pains of childbed women: ſometimes they have been employed in intermittent fevers and the nephritis. Theſe flowers are frequently alſo uſed externally in diſcutient and antiſeptic fomentations, and in emollient clyſters. They enter the *decoctum pro enemate* and *decoctum pro fomento* of the pharmacopœias. An eſſential oil was formerly directed to be prepared from them, but it is now omitted. A ſimple watery infuſion of them taken in a tepid ſtate, is at preſent frequently employed to promote the operation of emetics. The root of the pyrethrum is the only part endowed with medical virtue. It has no ſenſible ſmell; its taſte is very hot and acrid, but leſs ſo than that of arum or dracunculus: the juice expreſſed from it has ſcarce any acrimony, nor is the root itſelf ſo pungent when freſh, as after it has been dried. Water, aſſiſted by heat, extracts ſome ſhare of its taſte, rectified ſpirit the whole; neither of them elevate any thing in diſtillation. The principal uſe of the pyrethrum, in the preſent practice, is as a maſticatory, for promoting the ſalival flux, and evacuating viſcid humours from the head, and neighbouring parts; by this means, it often relieves the tooth-ach, pains of the head, and lethargic complaints.

ANTHERA, among botaniſts, that part of the ſtamen which is fixed on the top of the filamentum, within the corolla: it contains the pollen or fine duſt, which, when mature, it emits for the impregnation of the plant, according to Linnæus. See BOTANY.

ANTHOLOGY, *n. s.* 1. A collection of flowers.—2. A collection of devotions in the Greek church.—3. A collection of poems.

ANTHONY's FIRE, a kind of eryſipelas. The eryſipelas got this denomination, as thoſe afflicted with it mad their peculiar application to St. Anthony of Padua for a cure. It is known, that anciently particular diſeaſes had their peculiar ſaints: thus, in the ophthalmia, perſons had recourſe to St. Lucia; in the tooth-ach, to St. Apollonia; in the hydrophobia, to St Hubert, &c. See ERYSIPELAS.

ANTHROPOPHAGI, *n. s.* man-eaters; cannibals, thoſe who live upon human fleſh. That there have been, in almoſt all ages of the world, nations who have followed this barbarous practice, we have abundance of teſtimonies. The Cyclops, the Leſtrygons, and Scylla, are all repreſented in Homer as *anthropophagi*, or man-eaters; and the female phantoms, Circe and the Syrens, firſt bewitched with a ſhew of pleaſure, and then deſtroyed. This, like the other parts of Homer's poetry, had a foundation in the manners of the times preceding his own. When America was diſcovered, this practice was found to be almoſt univerſal, inſomuch that ſeveral authors have ſuppoſed it to be occaſioned through a want of other food, or through the indolence of the people to ſeek for it; though others aſcribe its origin to a ſpirit of revenge. It appears pretty certain from Dr. Hawkeſworth's Account of the Voyages to the South Seas, that the inhabitants of the iſland of New Zeland, a country unfurniſhed with the neceſſaries of life, eat the bodies of their enemies. It appears alſo to be very probable, that both the wars and anthropophagy of theſe ſavages take their riſe and owe their continuance to irreſiſtable neceſſity, and the dreadful alternative of deſtroying each other by violence or of periſhing by hunger. Mr. Maſden alſo informs us that this horrible cuſtom is practiſed by the Battas, a people in the iſland of Sumatra.

ANTI, a particle much uſed in compoſition, and ſignifies *contrary to*; as, *antimonarchical*, oppoſite to monarchy; *antifederal*, oppoſed to federal government. The particle *anti*, is not as is ſtated in ſome dictionaries, confined to words derived from the Greek, but is compounded with words in all the modern languages, often at the pleaſure of authors, to ſave circumlocution.

ANTIBES, a ſea port of France, in the department of Var, with a ſtrong caſtle. The adjacent grounds produce excellent fruit; and the town is ſituated 15 miles from Nice, in the Mediterranean. Loug. 82. 5. E. Lat. 43. 35. N.

ANTICHACHECTICK, *adj.* things adapted to the cure of a bad conſtitution.

ANTICHAMBER, *n. s.* See ANTECHAMBER.

ANTICHRIST, among eccleſiaſtical writers, denotes a great adverſary of Chriſtianity, who is to appear upon the earth, towards the end of the world. There have been demonſtrations, diſputations, and proofs, in great number, both that the pope is, and that he is not Antichriſt. F. Calmet is very full in deſcribing the father and mother of Antichriſt, his tribe and pedigree, his wars and conqueſts, his atchievements againſt Gog, Magog, &c. Some place his capital at Conſtantinople, others at Jeruſalem, others at Moſcow, and ſome at London; but the generality at Rome, though theſe laſt are divided. Grotius and ſome others ſuppoſe Rome Pagan to have been the ſeat of Antichriſt, and Caligula or Nero the perſon: Moſt of the Lutheran and reformed doctors contend earneſtly for Rome Chriſtian under the papal hierarchy. In fact, the point having been maturely debated at the council of Gap, held in 1603, a reſolution was taken thereupon, to inſert an article in the confeſſion of faith, whereby the pope is *formally declared* to be Antichriſt. In ſhort, the conjectures upon this ſubject are endleſs, and many of them abſurd and whimſical in the higheſt degree. We may obſerve, however, that amongſt Proteſtant divines, the deſcription of Antichriſt which we have in the New Teſtament, is almoſt univerſally ſuppoſed to apply to the papal hierarchy.

ANTICHRISTIAN, *adj.* oppoſed to Chriſtianity

To ANTICIPATE, *v. a.* 1. To take firſt poſſeſſion.—2. To take up before the time.—3. To foretaſte, or take an impreſſion of ſomething, which is not yet, as if it really was.—4. To preclude.

ANTICIPATION, *n. s.* 1. The act of taking up ſomething before its time.—2. Foretaſte.—3. Opinion implanted before the reaſons of that opinion can be known.

ANTICK, *adj.* odd; ridiculouſly wild.

ANTICK, *n. s.* 1. He who plays anticks, or uſes odd geſticulation: a buffoon.—2. Odd appearance.

To ANTICK, *v. a.* to make antick.

ANTICKLY, *adv.* in an antick manner; with odd poſtures; wild geſticulations, or fanciful appearance.

ANTIDOTAL, *adj.* that which has the quality of an antidote, or the power of counteracting poiſon.

ANTIDOTE, *n. s.* a medicine given to expel the miſchiefs of another, as of poiſon.

ANTIENT. See ANCIENT.

ANTIEPILEPTICS. See ANTEPILEPTICK.

ANTIGUA, or ANTEGO, one of the Antilles or Caribbee iſlands, ſituated 60 miles E. of St. Chriſtopher's, and 40 N. of Guadaloupe. It is about 20 miles long and as many broad, and 60 in circumference; and is reckoned the largeſt of all the Britiſh leeward iſlands, containing about 70,000 acres of ground. It is the ſeat of the governor general of theſe iſlands. Antigua having no rivers, and but few ſprings, or ſuch as are brackiſh, the inhabitans are obliged to preſerve the rain water in ciſterns. The air is not ſo wholeſome as in the neighbouring iſlands. Antigua is very ſubject to hurricanes; but has excellent harbours, particularly Engliſh harbour, which is capable of receiving the largeſt man of war in the navy. The principal trade, however, is carried on in the harbour of St. John's, the capital, ſituated in the N. W. part of the iſland, which has water ſufficiently deep for merchant veſſels. This iſland was firſt attempted to be ſettled by ſome Engliſh families about the year 1636, but it ſucceeded ſlowly till 1681, when it was taken under the care of government. Crops here are very unequal, and it is exceedingly difficult to furniſh an average. In 1787, no leſs than 254,706 cwt. of ſugar was ſent from Antigua to Britain, but in 1790. only 65,200 cwt. and in ſome years, owing to a long continued drought, they have no crops at all. This iſland is progreſſively decreaſing in produce and population. The laſt accurate returns were made to government in the year 1774, when the white inhabitants of all ages and ſexes were 2590, and the ſlaves 37,848. The legiſlature of Antigua ſet the firſt example of amelioration of the criminal law, reſpecting negro ſlaves, by allowing them a trial by jury, &c. And the inhabitants, ſtill more to their honour, have encouraged the propagation of the goſpel amongſt their ſlaves. Lat. 17. 30. N. Long. 15. E.

ANTILLÆ, or ANTILLES, Twenty-eight iſlands, lying between the ſouthern and eaſtern part of the American continent, and belonging to the Engliſh, French, and Dutch. *Antilles* is the French name, but the natives call them CARRIBBEES, which ſee.

ANTIMONARCHICAL, *adj.* againſt government by a ſingle perſon.

ANTIMONARCHIST, a perſon who maintains *antimonarchical* principles.

ANTIMONIAL, *adj.* made of antimony; having the qualities of antimony.

ANTIMONIALS, in medicine, preparations of antimony. See next article.

ANTIMONY, *n. s.* a blackiſh mineral ſubſtance, ſtaining the hands, full of long, ſhining, needle like ſtriæ, hard, and conſiderably heavy. It is found in different parts of Europe; as Bohemia, Saxony, Tranſylvania, Hungary, France, and England, commonly in mines by itſelf, intermixed with earth and ſtony matters. Sometimes it is blended with richer ores of ſilver, and renders the extraction of that metal difficult by volatilizing a part of the ſilver, or, in the language of the miners, *robbing the ore.* Antimony at firſt was of ſervice only in the compoſition of paint; but, in modern times, it is applied to many other uſes of great importance. It is a common ingredient in ſpeculums or burning concaves, ſerving to give the compoſition a finer texture. It makes a part in bell metal, and renders the ſound more clear. It is mingled with tin to make it more hard, white and ſounding: and with lead in the caſting of printer's letters, to render them more ſmooth and firm. It is alſo a general help in the melting of metals, and eſpecially in the caſting of cannon balls. It is likewiſe made uſe of for purifying and heightening the colour of gold. For a long time, it was eſteemed poiſonous. In 1566, its uſe was prohibited in France by an edict of parliament; and in 1609, one Beſnier was expelled the faculty for having given it. The edict was repealed in 1650; antimony having a few years before been received into the number of purgatives. In 1661, a new edict came forth, forbidding its uſe by any but doctors of the faculty.—It is now univerſally allowed, that pure antimony in its crude ſtate has no noxious quality; and that though many of its preparations are moſt virulently emetic and cathartic, yet, by a ſlight alteration or addition, they loſe their virulence, and become mild in their operations. The virtues of antimony in the diſeaſes of animals are greatly extolled. Pigs that have the meaſles are at all times recovered by it, which proves it a great purifier of the blood. Horſes, that have running heels, which cannot be cured by the common methods uſed by the farriers, will generally be cured by this medicine in a little time. The manner of uſing it is this: mix one drachm with every feed of oats which the horſe has in a morning. It is beſt put together in one place, buried under a few oats; and the horſe's head being with-held a little, and then let go juſt againſt that place, he will take it all in at a mouthful. Some horſes do not diſlike it; others obſtinately refuſe it, but to theſe it may be eaſily given in balls. The virtues of this drug in fattening of cattle has been thought imaginary, but experiment proves it to be truth.

Antimony, in medicine, &c. is not only given in ſubſtance, but many preparations of it are uſed; which are either emetic, cathartic, diaphoretic, or ſudorific. Crude antimony in powder is found good for diſſolving viſcidities, in cutaneous diſeaſes, and, as ſome very confidently aſſert, in convulſions and epilepſies. Crude antimony is recommended in palſies, pains and numbneſs, which come on after a ſalivation, and is ſaid to have cured ſeveral who were paralytic from other cauſes. The method of giving it, is to begin with three grains, increaſing the doſe with three grains every day, to half a drachm; after which the doſe is diminiſhed three grains every day, till it comes down to the quantity of the firſt doſe. Externally, in ointments, it is recommended for drying up ulcers, curing the itch, and in plaiſters for reſolving of tumors. There appears no reaſon for people's being afraid of giving crude antimony externally; experience ſhews it to be a ſafe medicine, unleſs by accident the acid of the ſtomach ſhould be ſufficient to act as a menſtruum to it. The preparations of antimony are, 1. Sulphur præcipitatum antimonii. 2. Crocus antimonii, called alſo crocus metallorum. 3. Crocus antimonii lotus. 4. Calx antimonii, called antimonium diaphoreticum. 5. Tartarum emeticum. 6. Cauſticum antimoniale. 7. Cinnabaris antimonii. 8. Regulus antimonii martialis. 9. Tinctura antimonii. 10. The Kermes mineral, or Carthuſian powder.

Eſſence of antimony, an emetic wine made with glaſs of antimony; to which is ſometimes added a ſpicy ſtomachic. Dr. Huxham ſays, he never found any antimonial preparation better, ſafer, and more efficacious than this ſimple infuſion of the glaſs of antimony in a generous white wine, with a little ſpice to render it more grateful to the ſtomach. This medicine given to twenty or thirty drops, operates by gentle ſweats, and purges in larger doſes very mildly. The judicious phyſician, here mentioned, recommends it in obſtinate rheumatiſms.

Powder of antimony is a mixture of two grains of emetic tartar, finely pulverized, with half a drachm of any of the teſtaceous powders. This is a ſubſtitute for Dr. James's febrifuge powder; and has the ſame virtues with the antimonial wine above deſcribed, and emetic tartar.

Antimony (ſays Mr. Boyle) alone, or aſſociated with one or two other ingredients, by a variety of operations and compoſitions, might be brought to furniſh a whole apothecary's ſhop: it will anſwer the phyſician's intention, whether he wants to employ a cathartic, or an emetic, a diuretic, diaphoretic, deobſtruent, bezoardic, or cordial. All theſe preparations of antimony, how ſevere ſoever alone, may be ſo managed, as to operate little or nothing at all in the *primæ viæ*, nor be perceived till they are got into the ſmalleſt veſſels.—And then it is they are qualified to combat the gout, pox, evil, &c. See Neumann's Chemical Works, p. 28, &c. And Macquer's Chemical Dictionary, under Antimony.

ANTINOMIANS, in eccleſiaſtical hiſtory, certain heretics who maintain the law of no uſe or obligation under the goſpel diſpenſation, or who hold doctrines which clearly ſuperſede the neceſſity of good works and a virtuous life.—The Antinomians took their origin from John Agricola about the year 1538, who taught, that the law is no way neceſſary under the goſpel; that good works do not promote our ſalvation, nor ill ones hinder it; that repentance is not to be preached from the decalogue, but only from the goſpel. This ſect ſprung up in England during the protectorate of Oliver Cromwell, and extended their ſyſtem of libertiniſm much farther than Agricola the diſciple of Luther. Some of their preachers expreſsly maintained, that as the elect cannot fall from grace, nor forfeit the Divine favour, the wicked actions they commit are not really ſinful, nor are they to be conſidered as inſtances of their violation of the divine law; & conſequently they have no occaſion either to confeſs their ſins, or to break them off by repentance. According to them it is one of the eſſential and diſtinctive characters of the elect, that they cannot do any thing which is either diſpleaſing to God or prohibited by the law.—Luther, Rutherford, Schluſſelburg, Sedgwick, Gataker, Witſius, Bull, Williams, &c. have written refutations; Criſp, Richardſon, Saltmarſh, &c. defences, of the Antinomians, and Wigandus, a compariſon between ancient and modern Antinomians. The doctrine of Agricola was in itſelf obſcure, and perhaps repreſented worſe than it really was by Luther, who wrote with acrimony againſt him, and firſt ſtyled him and his followers *Antinomians*. Agricola ſtood on his own defence, and complained that opinions were imputed to him which he did not hold. It is not fair to charge upon a man all the opinions that may be inferred from ſentiments, that have haſtily dropped from him, when he himſelf diſavows ſuch inferences.

ANTIOCH, or Antakia, a ſea-port town of Syria, ſituated on the Southern bank of the Orontes, or El Aaſi as it is called by the Turks, about 18 or 20 miles from its mouth, is now reduced from its ancient ſplendour and become like the other moſt celebrated cities in Syria, a poor and ruinous town. It was eſteemed the third city of the world; and is remarkable for being the place where the diſciples of Chriſt were firſt called Chriſtians. Its magnificent remains are ſtill viſible. The houſes at preſent are built with mud and ſtraw, and the ſtreets are extremely dirty and narrow. Antioch is ſituated 30 miles S. of Scandaroon, and 40. S. W. of Aleppo. Lat. 36. 45. N. Lon. 117. 45. E.

ANTIPÆDOBAPTISTS, a denomination given to thoſe who object to the baptiſm of infants; becauſe they ſay, infants are incapable of being inſtructed, and of making that profeſſion of faith which entitles them to this ordinance, and an admiſſion into church communion. See Baptists.

ANTIPAROS, an iſland in the Archipelago, oppoſite to Paros, in a weſtern direction, from which it is ſeparated by a ſtrait about ſeven miles over. It is the *Olearus* or *Oliaros*, mentioned by Strabo, Pliny, Virgil, Ovid, &c. and was, according to Heraclides Ponticus, as quoted by Stephanus, firſt peopled by a Phœnician colony from Sidon. According to M. Tournefort's account, it is about ſixteen miles in circumference, produces a little wine and cotton, with as much corn as is neceſſary for the maintenance of 60 or 70 families, who live together in a village at one end of the iſland, and are moſtly Malteſe and French corſairs.—This iſland is remarkable for a ſubterraneous cavern or grotto, accounted one of the greateſt natural curioſities in the world. From the accounts given of it by Magni, Tournefort, and Sanders, it appears to be about 180 feet high, 340 long, and 300 wide. The roof forms a pretty regular arch, from which hang an infinite variety of lapidious concretions, beautifully tranſparent, repreſenting grapes, feſtoons, ſpears, vegetables, curtains, marble pillars &c. and on the ſides and bottom are ſimilar cryſtalline petrefactions. Lat 37. 8. N. Lon. 100. 44. E.

ANTIPATHY. *n. s.* a natural contrariety to any thing, ſo as to ſhun it involuntarily.

Antipathy, in ethics, hatred, averſion, repugnancy. *Hatred* is entertained againſt perſons; *averſion* and *antipathy*, indiſcriminately againſt perſons or things; and *repugnancy*, againſt actions alone. *Hatred* is more voluntary than *averſion*, *antipathy*, or *repugnancy*. Theſe laſt have greater affinity with the animal conſtitution. The cauſes of antipathy are leſs known than thoſe of *averſion*. *Repugnancy* is leſs permanent than either the one or the other.—*Hatred* calumniates; *averſion* keeps us at a diſtance from certain perſons; antipathy makes us deteſt them; *repugnancy* hinders us from imitating them.

Antipathy, in phyſiology, is not uſed to ſignify ſuch incompatibilities as are merely phyſical; but rather to expreſs the averſion which an animated or ſenſitive being feels at the real or ideal preſence of particular objects. In this point of view, antipathy ſignifies "a natural horror and deteſtation, an inſuperable hatred, an involuntary averſion, which a ſenſitive being feels for ſome other object, whatever it is, though the perſon who feels this abhorrence is entirely ignorant of its cauſe, and can by no means account for it." Such is, they ſay, the natural and reciprocal hoſtility between the ſalamander and the tortoiſe, between the toad and the weaſel; or between ſheep and wolves. Such is the invincible averſion of particular perſons againſt cats, mice, ſpiders, &c. a prepoſſeſſion which is ſometimes ſo violent, as to make them faint at the ſight of theſe animals. Of theſe and a thouſand other antipathies the ancient naturaliſts, the ſchoolmen, and the vulgar, form ſo many legends; and relate them as certain facts, that they may demand an explication of them from the philoſophers. But we ſhould firſt inquire whether ſuch antipathies actually exiſt or not. To what then are theſe antipathies, of which we have heard ſo much reducible? Either, 1. to legendary tales:—2. to averſions againſt objects which we believe dangerous:—3. to a childiſh terror of imaginary perils: 4. to a diſreliſh, of which the cauſe is diſguiſed:—5. to a ridiculous affectation of delicacy; or, 6. to an infirmity of the ſtomach; in a word, to a real or pretended reluctance for things which are either inveſted, or ſuppoſed to be inveſted, with qualities hurtful to us. Too much care, therefore, cannot be taken to prevent, or regulate, the antipathies of children; to familiariſe them with objects of every kind; to diſcover to them, without emotion, ſuch as are dangerous; to teach them the means of defence and ſecurity, or the methods of eſcaping their noxious influence; and, when the rational powers are matured by age, to reflect on the nature of thoſe objects which we fear, to aſcertain what has been told concerning their qualities, or vigorouſly to exert our own reſolution to overcome thoſe vain repugnancies which we may feel. See Sympathy, which is the oppoſite to *Antipathy*.

ANTIPERISTALTIC, in anatomy, a motion of the inteſtines, contrary to the *periſtaltic* motion. As the periſtaltic motion is a contraction of the fibres of two inteſtines from above, downwards; the antiperiſtaltic motion is their contraction from below, upwards. Phyſicians, ancient as well as modern, have uſually had recourſe to the notion of an antiperiſtaltic motion, to account for the action of vomiting, and the phenomena of the iliac paſſion. The cauſe of the antiperiſtaltic motion is uſually aſſigned to be a ſtoppage of ſome of the inteſtines, but chiefly of the ilium.—Mr. Littre urges many arguments in favour of this doctrine; but ſome late ingenious authors have overturned the whole antiperiſtaltic ſyſtem, and ſhown this motion imaginary, as well as unneceſſary for accounting for theſe diſorders. Meſſ. Chirac and du Verney have endeavoured to prove this in reſpect of vomiting; Meſſ. Haguenot and St. Andre, in the iliac paſſion.

ANTIPODES, *n. s.* Thoſe people who, living on the other ſide of the globe, have their feet directly oppoſite to ours. The antipodes lie under oppoſite meridians and oppoſite parallels; in the ſame degree of latitude, but of oppoſite denominations, the one being North, and the other South. They have nearly the ſame degree of heat and cold, days and nights of equal length, but in oppoſite ſeaſons. It is noon to one, when midnight to the other; and the longeſt day with one, is the ſhorteſt with the other.—Plato is eſteemed the firſt who thought it poſſible that antipodes exiſted, and is looked upon as the inventor of the word. As this philoſopher apprehended the earth to be ſpherical, he had only one ſtep to make, to conclude the exiſtence of antipodes. The ancients, in general, treated this opinion with the higheſt contempt. Lactantius and Auguſtine, laughed at the notion of antipodes. The latter of theſe fathers is ſtrangely perplexed to think, how men and trees ſhould hang pendulous in the air, with their feet uppermoſt, as he thought they muſt do in the other hemiſphere! and a biſhop of the 8th century was declared a *heretic*, for maintaining that there were ſuch beings as antipodes. But the Chriſtian fathers were not the only perſons who diſputed the truth of the antipodes. Lucretius had done it before them, at the end of his firſt book, v. 1063, &c. See alſo Plutarch, lib. *De facie in orbe lucinæ*; and Pliny, who refutes the opinion, lib. ii. cap. 5. They never reflected that theſe terms *upwards* and *downwards* are merely relative; and ſignify only nearer to, or farther from, the centre of the earth, the common centre, to which all heavy bodies gravitate; and that, therefore, our antipodes have not their feet upwards, and head downwards, any more than ourſelves; for they, as well as we, have their feet nearer the centre of the earth, and their heads farther from it. To have the head downwards, and feet upwards, is to place the body in a direction of gravity, tending from the feet to the head: but this cannot be ſuppoſed with regard to the antipodes; for they, as well as we, tend toward the centre of the earth, in a direction from head to foot.

ANTIQUARIES, perſons who ſearch after and collect all relicts of antiquity, ſuch as old books, coins, medals, ſtatues, ſculptures, inſcriptions, and every thing that tend, to throw light on ancient hiſtory. In the chief cities of Greece and Italy, there were perſons of diſtinction called *antiquaries*, whoſe buſineſs it was to ſhow ſtrangers the antiquities of the place, to explain the ancient inſcriptions, and to give them all the aſſiſtance they could in this way of learning. There was an ancient college of antiquaries erected in Ireland by Ollahm Fodhla, 700 years before Chriſt, for compoſing a hiſtory of that country; And to this, ſay the Iriſh hiſtorians, it is owing that the hiſtory and antiquities of that kingdom may be traced back beyond thoſe of moſt other nations. There is a ſociety of antiquaries in London, and another in Edinburgh, incorporated by Royal charter.

ANTIQUARY, *n. s.* a man ſtudious of antiquity; a collector of ancient things.

To ANTIQUATE, *v. a.* to put out of uſe; to make obſolete.

ANTIQUE, *adj.* 1. Ancient; old; not modern.—2. Of genuine antiquity.—3. Of old faſhion.—4. Odd; wild; antic.

Antique, *n. s.* an antiquity; a remain of ancient times.

ANTIQUITIES, a term implying all teſtimonies, or authentic accounts, that have come down to us of ancient nations. Bacon calls antiquities *the wrecks of hiſtory*, or ſuch particulars as induſtrious and learned perſons have collected from genealogies, inſcriptions, monuments, coins, names, etymologies, archives, inſtruments, fragments of hiſtory, &c. The ſtudy of antiquities forms a very extenſive ſcience, or rather comprehends a general acquaintance with all the ſciences, as including an hiſtorical knowledge of the edifices, magiſtrates, offices, habiliments, manners, cuſtoms, ceremonies, worſhip, and other objects worthy of curioſity, of all the principal ancient nations of the earth.

ANTIQUITY, *n. s.* 1. Old times; time paſt long ago. 2. The people of old times; the ancients.—3. The works or remains of old times.—4. Old age. There is ſcarce a nation under heaven but lays claim to a greater degree of antiquity than the reſt of its neighbours: the Scythians, the Phrygians, the Chaldeans, Egyptians, Greeks, Chineſe, &c. pretend each to have the honor of being the firſt inhabitants of the earth; ſeveral of theſe nations, leſt they ſhould be outſtripped in their pretenſions by any of the reſt, have traced up their origin to ages long before the received account of the creation. The Chaldeans pretend to aſtronomical obſervations of 470,000, or 473,000 years; they mention the preciſe king who reigned over them at the time of the deluge, whoſe name was Xiſuthrus, and attribute to him ſeveral things which we aſcribe to Noah. St. Auguſtine laughs at the folly of the Egyptians who pretend to obſervations of the ſtars above 100,000 years old; in effect, no people appear to have been warmer in the conteſt for antiquity than thoſe of Egypt. Yet the Scythians, the Phrygians, the Ethiopians, and ſome others, ſtill inſiſted on their *priority* to the Egyptians. But the Chineſe pretend to be the moſt ancient monarchy in the univerſe; having cultivated the ſciences from the earlieſt ages, and ſubſiſted at leaſt theſe 4000 years with the ſame laws, manners, and uſages! Some indeed have called in queſtion the authenticity of the Chineſe annals; yet we find them confirmed, at leaſt as high as 660 years before Chriſt, by the annals of Japan. The Britiſh have alſo laid claim to very high antiquity; but before Cæſar's invaſion their hiſtory is utterly dubious, not to ſay fabulous. Old chronicles ſpeak of Samothes, the ſon of Japhet, as the founder of the Britiſh monarchy; Albion, a deſcendant of Cham, invaded it 300 years after; and about 600 years after this, Brute, grand ſon of Æneas, came and took poſſeſſion of the iſland in the year of the world 2880, giving it the name which it ſtill retained when Cæſar made his attempt. This is Geoffry of Monmouth's ſyſtem of the antiquity of the Britiſh nation. It muſt not be forgot that the Iriſh alſo pretend to be the moſt ancient of all nations; they trace their origin without interruption up to Japhet! And the ancient Scots hiſtorians have not been much behind hand with them, as they trace their origin from an elder branch of the Scythians, the firſt of men; and from a mixture of Scythians, Greeks, Jews, and Egyptians, who emigrated under the command of Gathelus the ſon of Cecrops king of Athens, who married Scota the daughter of Pharaoh king of Egypt in the days of Moſes.

ANTISCII, *n. s.* in geography, the people who inhabit on different ſides of the equator, who, conſequently, at noon, have their ſhadows projected oppoſite ways. Thus the people of the north are denominated *Antiscii* to thoſe of the ſouth; the one projecting their ſhadows at noon toward the north pole, and the other toward the ſouth pole. The Antiſcii is alſo uſed, among aſtrologers, for two points of the heavens, equally diſtant from the tropics.—Thus the ſigns Leo and Taurus are held *Antiscii* to each other.

ANTISEPTIC, an appellation given to ſuch ſubſtances as reſiſt putrefaction. Sir John Pringle has made ſome curious experiments in relation to antiſeptic ſubſtances, to aſcertain their ſeveral virtues. Thus in order to ſettle the antiſeptic virtue of ſalts, he compared it with that of common ſea ſalt; which being one of the weakeſt, he ſuppoſes equal to unity, and expreſſes the proportional ſtrength of the reſt by higher numbers, as in the following table.

ANTISEPTIC PROPORTIONAL VIRTUES OF DIFFERENT SALTS.

Sea-Salt - - - -	1	Saline mixture - -	3
Sal gemmæ - - -	1+	Nitre - - - - - -	4+
Tartar vitriolated	2	Salt of hartſhorn - -	4+
Spiritus Mindereri	2	Salt of wormwood	4+
Tartarus ſolubilis -	2	*Borax* - - - -	12+
Sal diureticus - - -	2+	Salt of amber - -	20+
Crude *ſal ammoniac*	3	Alum - - - - -	30+

In the above table the proportions are marked in integral numbers: only to ſome there is added the ſign + to ſhow, that thoſe ſalts are poſſeſſed of a ſtronger antiſeptic virtue than the number in the table expreſſes, by ſome fractions; unleſs in the three laſt, where the ſame imports that the ſalt may be ſtronger by ſome units. Some reſinous and other ſubſtances even exceed the antiſeptic virtues of the neutral ſalts; thus myrrh, aſafœtida, terra japonica, and aloes, are at leaſt 12 times more antiſeptic than ſea-ſalt. Two grains of camphor is equivalent to 60 grains of that ſalt. An infuſion of a few grains of Virginia ſnake-root, in powder, exceeds 12 times its weight of ſea-ſalt. Peruvian bark and camomile flowers have nearly the ſame extraordinary quality. Beſides theſe, pepper, ginger, ſaffron, contrayerva-root, are 12 times more antiſeptic than ſea-ſalt. Dried ſage, rhubarb, the root of the wild valerian, mint, angelica, ground ivy, ſenna, green-tea, red roſes, wormwood, muſtard, and horſe-radiſh, were likewiſe found more antiſeptic than the ſtandard. To the claſs of antiſeptic medicines may likewiſe be added fermented liquors, acids, ſpirits, and even thoſe plants called *anti-acids*, and erroneouſly ſuppoſed haſteners of putrefaction, particularly horſe-radiſh. Vegetables, poſſeſſing this virtue, are the more valuable, that being uſually *free of acrimony*, they may be taken in much greater quantities, than either ſpirits, acids, reſins, or even the neutral ſalts. Antiſeptics are preſcribed in all putrid, malignant, and peſtilential caſes. It is to be remarked, however, that different kinds of them are to be given in different diſeaſes, and in different ſtages of the ſame diſeaſe. Thus, the bark is a ſpecific in a gangrene, when the veſſels are relaxed, and the blood reſolved or diſpoſed to putrefaction; but will fail if the veſſels are too full, or the blood too thick. With the ſame caution is the bark to be uſed in wounds; viz. chiefly in caſes of abſorbed matter, when it infects the humours, and brings on a hectic fever. By the great antiſeptic virtue of alum, the bark, and other aſtringents, it ſhould ſeem, that aſtriction had no ſmall ſhare in the cure of putrid diſorders; and, indeed the very nature of putrefaction conſiſts in a ſeparation or diſunion of the parts. But as aſtringents are improper to be adminiſtered in many caſes, contrayerva-root, ſnake-root, camphor, &c. may ſupply their place; which, though highly antiſeptic, have very little, or any, of an aſtringent quality. See Pringle's Obſervations on the Diſeaſes of the Army, and Dr. M'Bride's Eſſay on the reſpective powers, &c. of antiſeptics.

ANTISPASMODICK, that which has the power of relieving the cramp. *Antiſpaſmodics* are more accurately defined, medicines proper for the cure of ſpaſms and convulſions. Opium, balſam of Peru, and the eſſential oils of many vegetables, are the principal in this claſs of medicines. Opium excells for its immediate effects. Peruvian balſam, in many inſtances, produces more laſting benefit than opium, and ſometimes ſucceeds where opium fails. As antiſpaſmodics, the eſſential oils differ in this from opium, that they act more on a particular part than on the ſyſtem in general, and have no ſoporific effect. Some medicines remove ſpaſms by immediate contact, as aſſes milk cream, oil of almonds; others by repelling heat, as gas, ſulphur, nitre, ſal ammoniac, &c. And where the ſtrictures are produced by inanition and a defect of vital heat, ſpaſms are removed by thoſe medicines that reſtore the *vis vitæ*, ſuch as valerian, caſtor, muſk, &c.

ANTITHESIS, *n. s.* oppoſition of words or ſentiments. *Antitheſis* in grammar, a figure whereby one letter is ſubſtituted in the room of another; as *olli* for *illi*. *Antitheſis* in rhetoric, a contraſt or oppoſition of words or ſentiments. Such is that of Cicero, in his ſecond oration againſt Cataline.—"On one ſide ſtands modeſty, on the other impudence; on one fidelity, on the other deceit; here piety, there ſacrilege; here continency, there luſt, &c." St. Auguſtine, Seneca, Salvian, and many other ancient writers, ſeem greatly to affect antitheſis; but among the moderns they are generally decried.

ANTITRINITARIANS, thoſe who deny the Trinity, and teach that there are not three perſons in the Godhead. Thus the Samoſatenians, who do not believe the diſtinction of perſons in God; the Arians who deny the divinity of the Word; and the Macedonians, who deny that of the Holy Spirit, are all properly Antitrinitarians. Among the moderns, Antitrinitarians are particularly underſtood of Socinians, or Unitarians. See UNITARIAN.

ANTITYPE, *n. s.* that which is reſembled or ſhadowed out by the type; that of which the type is the repreſentation. It is a term of theology. See TYPE.

ANTLER, *n. s.* properly the firſt branches of a ſtag's horns; but popularly and generally, any of his branches.

ANTOECI, *n. s.* *It has no ſingular.* In geography, thoſe inhabitants of the earth, who live under the ſame meridian, and at the ſame diſtance from the equator; the one toward the north, and the other to the ſouth. Hence they have the ſame longitude, and their latitude is alſo the ſame, but of a different denomination. They are in the ſame ſemicircle of the meridian, but oppoſite parallels. They have preciſely the ſame hours of the day and night, but oppoſite ſeaſons; and the night of the one is always equal to the day of the other.

ANTWERP, or ANVERS, a city in the Auſtrian Netherlands, but now the capital of the new French department of Deux Nattes. This city lies on a low marſhy ſituation, on the river Scheldt, and is large and well built, containing 22 ſquares, and above 200 ſtreets, all ſtraight and broad, eſpecially that called the *Mere*, in which ſix coaches can go abreaſt. Moſt of the houſes are of freeſtone, and have an air of antiquity, being high, with courts before and gardens behind. The cathedral dedicated to the Virgin Mary, the ſtadt-houſe, and the exchange, are magnificent ſtructures: the latter is the firſt building of that kind in Europe, and on its model the exchanges of London and Amſterdam are built. Antwerp, towards the end of the 15th century, was a very flouriſhing town. The Scheldt, on which it ſtands, being 20 feet at low water, and riſing 20 feet more at flood, ſhips of the greateſt burden came up to the keys; but when the United Provinces formed themſelves into a free ſtate, after having ſhaken off the yoke of Spain, they got the entire command of the navigation of the Scheldt; which ruined the trade of Antwerp, and transferred it to Amſterdam. This made the inhabitants turn to painting, jewelling, and banking, which they have continued to this day with great ſucceſs and reputation. Antwerp has alſo a fine manufacture of tapeſtry and lace. No city in the Netherlands has ſo many and ſo fine churches as this, many of which, particularly the cathedral and Jeſuit's church, are adorned with moſt elegant paintings, by Sir Peter Paul Rubens, who was a native of this city, and other eminent artiſts. During the civil wars in the 15th century, this city ſuffered exceedingly: but what put a final ſtop to its proſperity was the treaty of Munſter, concluded in 1648, between Spain and the United Provinces, when the former admitted the independence of the latter. One of the articles of that treaty ſtipulated that no large ſhip ſhould go directly to Antwerp, but ſhould unload its cargo in Holland. This induced many of the merchants to remove to Amſterdam with their capitals; and a contagious diſorder, which prevailed ſome years afterwards, reduced the city exceedingly, both in its trade and population. The late emperor Joſeph made a pretence of again opening the navigation of the Scheldt, but the ſcheme proved abortive. It was taken by the French in 1792; but abandoned the year following. They again took poſſeſſion of it in July 1794, together with the reſt of the Auſtrian Netherlands: the Duke of York being obliged to abandon the defence of it, after the defeat of the Prince of Cobourgh and his retreat towards Maſtricht; and it now conſtitutes a part of the French Republic. Advantageouſly ſituated for commerce, and in the centre of a rich and populous country, it is probable, that its ancient trade will, in a great meaſure be reſtored; ſince, according to the laſt accounts from Europe, it is ſaid to be declared a free port. Antwerp lies 33 leagues S. from Amſterdam; 40 E. N. E. from Calais; 31 N. from Valenciennes; and 79 N. from Paris. Lat. 51. 32. N. Long. 79. 36. E.

ANVIL, *n. s.* 1. The iron block on which the ſmith lays his metal to be forged.—2. Any thing on which blows are laid.

ANUS, in anatomy, the lower extremity of the inteſtinum rectum, or orifice of the fundament. See ANATOMY. Alſo a ſmall hole in the third ventricle of the brain. The diſeaſes of the anus are a fiſtula, and the *procedentia*, or *prolapſus ani*; to which may be added the hæmorrhoids, or piles. When children are born without an anus, it is very difficult to hit on the right part for making a perforation in the rectum, becauſe the extremity of the gut is generally formed into a knot. For performing ſuch a perforation, Mr. Petit recommends a trocar, the *canula* and circular plate of which are ſo ſlit open, as to ſerve as a groove for a biſtoury to be run in, to enlarge the aperture after the trocar has been puſhed into the gut.

ANXIETY, *n. s.* 1. Trouble of mind about ſome future event; perplexity; ſolicitude.—2. Depreſſion; lowneſs of ſpirits.

ANXIOUS, *adj.* 1. Diſturbed about ſome uncertain event; ſolicitous.—2. Careful; full of inquietude; unquiet.

ANXIOUSLY, *adv.* in an anxious manner.

ANY, *adj.* 1. Every; whoever; whatever.—2. It is uſed in oppoſition to *none*.

AORIST, among grammarians, a tenſe peculiar to the Greek language, expreſſing an action in an indeterminate manner, without any regard to paſt, preſent, or future—although it moſt commonly has a reference to what is paſt.

AORTA, *n. s.* the great artery which riſes immediately out of the left ventricle of the heart. See Anatomy, page 415.

APACE, *adv.* quickly; ſpeedily.

APALACHIAN Mountains. See Allegany and America.

APALACHICOLA, a large and navigable river, having its ſource in the ſouth end of the Apalachian mountains, and running through the ſtate of Georgia, under the name of Chatahoochee, paſſes into Spaniſh America, receives Flint river, and ſeparating the two Floridas, falls into a bay of its own name, at Cape Blaize, in the Gulph of Mexico. From its ſource to the 32d degree of N. lat. it runs nearly S. W. from thence to its mouth almoſt due S.

Apalachicola, or apalchucla, according to Mr. Bartram, is likewiſe, the capital of the Creek or Moſcogulge confederacy. It is ſituated about a mile and a half above the ancient Apalachicola,, which ſtood on a peninſula, formed by a bend in the river; but, as, on account of the lowneſs of the ſituation, it had ſuffered greatly by inundations, it was deſerted by the inhabitants about 1756. This town, ſays Mr. Bartram, is ſacred to peace, no captives being put to death or human blood ſpilt here; and in time of war, whenever a general peace is propoſed, deputies from all the towns in the confederacy aſſemble here in order to deliberate. On the other hand the great Cowetta town, 13 miles up the river, is called the Bloody Town, where the chiefs and warriors meet, when a general war is propoſed; and here captives and malefactors are put to death.

APART, *adv.* 1. Separately from the reſt in place.—2. In a ſtate of diſtinction.—3. At a diſtance; retired from the other company.

APARTMENT, *n. s.* a room; a ſet of rooms.

APATHY, *n. s.* the quality of not feeling; exemption from paſſion; freedom from mental perturbation.

APE, in zoology, the general Engliſh name of a very numerous race of animals, remarkable for imitating what they ſee. See Simia.

To Ape, *v. a.* to imitate, as an *ape* imitates human actions.

APEAK, or Apeek, *adv.* in a poſture to pierce the ground.

APENNINUS, the Appennine, a ridge of mountains, running through the middle of Italy, from N. W. to S. W. for 700 miles, in the form of a creſcent: extending from the Alps in Liguria to the ſtrait of Meſſana, or Reggio, and the promontory Leucopetra; and ſeparating, as by a ridge, the Adriatic from the Tuſcan ſea. This mountain, though high, is greatly ſhort of the height of the Alps. It name is Celtic, ſignifying a *high mountain*; but though this is the general name of the chain, it aſſumes different names in diffeſent places.

APEPSY, *n. s.* indigeſtion, or it may be further defined a defect in the ſtomach, which prevents the aliment taken in, from affording a proper chyle for ſupplying the blood, and nouriſhing the body. Abſtemiouſneſs and exceſs are alike cauſes of indigeſtion. The columbo root is particularly uſeful, when the ſtomach is languid, and digeſtion difficult, &c. It may be given in ſubſtance with any grateful aromatic, or in Madeira wine, now and then interpoſing gentle doſes of rhubarb in tincture. A mixture of muſtard ſeed, with the columbo root, is of great utility in caſes of this nature, where acidity and flatulence prevail much in the *primæ viæ*.

APER, in zoology, a ſynomime of the ſus ſcrofa. See Sus.

APERIENT, *adj.* that which has the quality of opening. *Aperients*, in the materia medica, are more accurately defined medicines that facilitate the circulation of the humours by removing obſtructions.—The five aperient roots of the ſhops are ſmallage, fennel, aſparagus, parſley, and butcher's broom. The five leſſer aperients are, madder, graſs, eryngo, capers, and chammock.

APERITIVE, *adj.* that which has the quality of opening the excrementitious paſſages of the body.

APERTION, *n. s.* an opening; a paſſage through any thing; a gap.

APERTLY, *adv.* openly; without covert.

APERTNESS, *n. s.* openneſs.

APERTURE, *n. s.* 1. The act of opening.—2. An open place.

APETALOUS, *adj.* without petala or flower leaves.

APEX, *n. s.* *apices*, plur. The tip or point of any

Apex, in antiquity, the creſt of a helmet, but more eſpecially a kind of cap worn by the flamens.

thing.

APHELIA, in rhetoric, is uſed to denote *ſimplicity* of diction.

APHELION, *n. s.* that point of the earth's or a planet's orbit, in which it is at the greateſt diſtance from the ſun. See Astronomy.

APHIS, in zoology, the pucerон, vine-fretter, or plant-louse; a genus of inſects belonging to the order of inſecta hemiptera.—The roſtrum or beak of the aphis is inflected; the antennæ or feelers are longer than the thorax; the wings are four, and erect, or they are wanting; the feet are of the ambulatory kind; and the belly often ends in two horns, from which is ejected that moſt delicate juice called Honeydew; which ſee. Linnæus enumerates 33 ſpecies of the aphis, all of them inhabitants of particular plants, from which their trivial names are taken; as, aphis ribis, rosæ, ulmi, &c. And he adds, that there ſeem to be a greater variety of plants producing aphides than there are different ſorts of this inſect. But ſome late obſervers have been able to diſtinguiſh more than double the above number of ſpecies; and it is probable that many more remain ſtill to be added, as many of the ſame kind of plants are found to ſupport two or three quite different ſorts of aphides. Thus the plum-tree has two ſorts very diſtinct from each other: one of a yellowiſh green, as it were enamelled with white, and the ſhape more oblong; and the roſe-tree, ſupports not leſs than three diſtinct ſpecies: the largeſt is of a deep green, having long legs of a browniſh caſt, with the joints of a very dark brown, as are alſo the horns and antennæ; a ſecond ſort is of a paler green. has much ſhorter legs, and a more flat body; the third ſort is of a pale red, its body tranſparently wrinkled, and is moſt frequently on the ſweet-briar.

The extraordinary nature of theſe inſects has for ſome time paſt juſtly excited the wonder and attention of naturaliſts. They were long ranked among the animals which had been claſſed with the true androgynes ſpoken of by Mr. Breynius, for having never been catched copulating, it was haſtily concluded that they multiplied without copulation. This, however, was but a doubt, or at beſt but a mere ſurmiſe: but this ſurmiſe was believed and adopted by Mr. Reaumur; and though he ſupported it by ſome obſervations peculiar to himſelf, the queſtion remained ſtill undecided, till Mr. Bonnet ſeemed to have cleared it up in the affirmative, by taking and ſhutting up a young aphis at the inſtant of its birth, in the moſt perfect ſolitude, which yet brought forth in his ſight 95 young ones. The ſame experiment being made on one of the individuals of this family, that had been tried with its chief, the new hermit ſoon multiplied like its parent; and one of this third generation, in like manner brought up in ſolitude, proved no leſs fruitful than the former. Repeated experiments, in this reſpect, as far as the fifth or ſixth generation, all uniformly preſenting the obſerver with *fecund virgins*, were communicated to the Royal Academy of Sciences; when an unforeſeen and very ſtrange ſuſpicion, imparted by Mr. Trembley to Mr. Bonnet, engaged him anew in a ſeries of ſtill more painful experiments than the foregoing. In a letter which that celebrated obſerver wrote to him from the Hague, the 27th January, 1741, he thus expreſſes himſelf: "I formed, ſince the month of November, the deſign of rearing ſeveral generations of ſolitary pucerons, in order to ſee if they would all equally bring forth young. In caſes ſo remote from uſual circumſtances, it is allowed to try all ſorts of means; and I argued with myſelf, Who knows, but that one copulation may ſerve for ſeveral generations? This "*who knows*," to be ſure, was next to avouching nothing; but as it came from Mr. Trembley, it was ſufficient to perſuade Mr. Bonnet that he had not gone far enough in his inveſtigation. If the fecundity of aphides was owing to the ſecret copulation ſuggeſted by Mr. Trembley, this copulation ſerved at leaſt five or more ſucceſſive generations. Mr. Bonnet therefore reared to the amount of the tenth generation of ſolitary aphides, and had the patience to keep an account of the days and hours of the births of each generation. In ſhort, it was diſcovered, that they are really diſtinguiſhed by ſexes: That there are males and females amongſt them, whoſe amours are the leaſt equivocal of any in the world: that the males are produced only in the tenth generation, and are but few in number: that theſe ſoon arriving at their full growth, copulate with the females: that the virtue of this copulation ſerves for ten generations: that all theſe generations, except the firſt, (from the fecundated eggs) are produced viviparous; except thoſe of the laſt generations, among whom, as we have already obſerved, ſome males make their appearance, to lay the foundations of their firſt ſeries. Theſe circumſtances have been confirmed by other naturaliſts. In particular, we have a curious and accurate detail of them by Dr. Richardſon of Rippon, in the Philoſophical Tranſactions, Vol. xi. art. 22. an extract of which we ſhall here inſert, in order to give the reader as full an inſight into the nature of theſe ſingular inſects, as can be done by a mere detail of facts in themſelves utterly unaccountable.

"The great variety of ſpecies which occur in the inſects now under conſideration, may make an enquiry into their particular nature ſeem not a little perplexed; having them, however, ſkilfully reduced under their proper genus, the difficulty is by this means conſiderably diminiſhed. All the inſects comprehended under any diſtinct genus, we may reaſonably ſuppoſe to partake of one general nature; and, by generally examining any of the particular ſpecies, may thence gain ſome inſight into the nature of all the reſt. With this view I have choſen, out of the various ſorts of aphides, the largeſt of thoſe found on the roſe tree; not only as its ſize makes it the more conſpicuous, but as there are few others of ſo long duration. This ſort, appearing early in the ſpring, continues late in the autumn; while ſeveral are limited to a much ſhorter term, in conformity to the different trees and plants from which they draw their nouriſhment. I. If at the beginning of February, the weather happens to be ſo warm as to make the buds of the roſe tree ſwell and appear green, the aphides are frequently to be found upon them, not larger than the young ones in ſummer when firſt produced. But there being no old ones to be found at this time of the year, which in ſummer I had obſerved to be viviparous, I was formerly not a little perplexed by ſuch appearances, and almoſt induced to give credit to the old doctrine of equivocal generation. That the ſame kind of animal ſhould at one time of the year be viviparous, and at another time oviparous, was an opinion I could then by no means entertain. This, however, frequent obſervation has at laſt convinced me to be fact; having found theſe aphides which appear early in the ſpring, to proceed from ſmall black oval eggs which were depoſited on the laſt years ſhoots in autumn: though, when it happens that the inſects make too early an appearance, I have obſerved the greateſt part to ſuffer from the ſharp weather that uſually ſucceeds, by which means the roſe trees are ſome years in a manner freed from them. Thoſe which withſtand the ſeverity of the weather ſeldom come to their full growth before the month of April; at which time they uſually begin to breed, after twice caſting off their exuviæ or outward covering. It appears then that they are all females, which produce each of them a very numerous progeny, and that without having intercourſe with any male inſect. As I obſerved before, they are viviparous; and what is equally uncommon, the young ones all come into the world backwards. When they firſt come from the parent, they are enveloped by a thin membrane, having in this ſituation the appearance of an oval egg; which, I apprehend, muſt have induced Reaumur to ſuſpect that the eggs diſcovered by Bonnet were nothing more than mere abortions. Theſe egg-like appearances adhere by one extremity to the mother; while the young ones contained in them extend the other; by that means gradually drawing the ruptured membrane over the head and body to the hind feet.

During this operation, and for ſome time after, by means of ſomething glutinous, the fore part of the head adheres to the vent of the parent. Being thus ſuſpended in the air, it ſoon frees itſelf from the membrane in which it was confined, and, after its limbs are a little ſtrengthened, is ſet down on ſome tender ſhoot, and then left to provide for itſelf.

"II. In the ſpring months, there appear on the roſe trees but two generations of aphides, including thoſe which immediately proceed from the laſt year's eggs; the warmth of the ſummer adds ſo much to their fertility, that no leſs than five generations ſucceed one another in the interval. One is produced in May, which caſts off its covering; while the months of June and July each ſupply two more, which caſt off their coverings three or four times, according to the different warmth of the ſeaſon. This frequent change of the outward covering is the more extraordinary, as it is the ofteneſt repeated when the inſects come the ſooneſt to their growth; which I have ſometimes obſerved to happen in ten days, where warmth and plenty of nouriſhment have mutually conſpired. From which conſiderations I am thoroughly convinced that theſe various coverings are not connate with the inſect; but that they are, like the ſcarfſkin, ſucceſſively produced. Early in the month of June, ſome of the third generation which were produced about the middle of May, after caſting off their laſt covering, diſcover four erect wings, much longer than their bodies: and the ſame is obſervable in all the ſucceeding generations, which are produced during the ſummer months; without, however, diſtinguiſhing any diverſity of ſex, as is uſual in ſeveral other kinds of inſects. For ſome time before the aphides come to their full growth, it is eaſy to diſcover which of them will have wings, by a remarkable fullneſs of the breaſt, which, in the others, is hardly to be diſtinguiſhed from the body. When the laſt covering is ejected, the wings, which were before folded up in very narrow compaſs, gradually extend themſelves in a moſt ſurpriſing manner, till their dimenſions are at laſt very conſiderable. But theſe winged ones have the peculiarity, that the number of them does not ſeem ſo much to depend on their original ſtructure, as on the quantity or quality of the nouriſhment with which they are ſupplied: it being frequently obſerved, that thoſe on a ſucculent ſhoot have few or none with wings among them, while others of the ſame generation, on a leſs tender branch, are moſt of them winged; as if only the firſt rudiments of wings were compoſed in the former, while nature thought proper to expand them in the latter, that they might be more at liberty to ſupply their wants. The increaſe of theſe inſects in the ſummer time is ſo very great, that, by wounding and exhauſting the tender ſhoots, they would frequently ſuppreſs all vegetation, had they not many enemies which reſtrain them. To enumerate the variety of other inſects that in their worm and fly ſtate are conſtantly deſtroying them, would exceed the bounds of the preſent deſign: there is one, however, ſo ſingular in the manner of executing its purpoſe, that I cannot paſs by it without ſome further notice. This is a very ſmall black ichneumon fly, with a ſlender body and very long antennæ, which darts its pointed tail into the body of the aphides, at the ſame time depoſiting an egg in each. This egg produces a worm, which feeds upon the containing inſect till it attains its full growth; when it is uſually changed to that kind of fly from whence it came. In this, however, it is ſometimes prevented by another ſort of ſmall black fly, which wounds this worm through its pearl-like habitation; and by laying one of its eggs therein, inſtead of the former fly, produces its own likeneſs. I muſt, however, further obſerve, notwithſtanding theſe inſects have many enemies, they are not without friends; if we may conſider thoſe as ſuch who were very officious in their attendance, for the good things they expect to reap thereby. The ant and the bee are both of this kind, collecting the honey in which the aphides abound; but with this difference, that the ants are conſtant viſitors, the bee only when flowers are ſcarce. To which let me alſo add, that the ants will ſuck in the delicious nectar while the aphides are in the act of diſcharging it from the anus; but the bees only collect it from the leaves on which this honey dew has fallen."

In the autumn I find three more generations of aphides to be produced; two of which make their appearance in the month of Auguſt, and the third uſually appear before the middle of September. As the two firſt differ in no reſpect from thoſe which we meet with in ſummer, it would be waſting time to dwell any longer upon them; but the third, differing greatly from all the reſt, demands our giving it a more ſerious attention. Though all the aphides which have hitherto appeared were females, in this tenth generation are found ſeveral male inſects; not that they are by any means ſo numerous as the females, being only produced by a ſmall number of the former generation. To which I muſt further add, that I have obſerved thoſe which produce males, previouſly to have produced a number of females; which in all reſpects reſembling thoſe already deſcribed, I ſhall decline taking into any further conſideration. The females have at firſt altogether the ſame appearances with thoſe of the former generations; but in a few days their colour changes from a green to a yellow, which is gradually converted into an orange colour before they come to their full growth. They differ likewiſe in another reſpect, at leaſt from thoſe which occur in ſummer, that all thoſe yellow females are without wings. The male inſects are, however, ſtill more remarkable, their outward appearance readily diſtinguiſhing them from the females of this and of all other generations. When firſt produced, they are not of a green colour like the reſt, but of a reddiſh brown; and have afterwards, when they begin to thicken about the breaſt, a dark line along the middle of the back. Theſe male inſects come to their full growth in about three weeks time, and then caſt off their laſt covering; the whole inſect being after this operation, of a bright yellow colour, the wings only excepted. But after this they ſoon change to a darker yellow, and in a few hours to a very dark brown; if we except the body, which is ſomething lighter coloured, and has a reddiſh caſt. They are all of the winged ſort; and the wings, which are white at firſt, ſoon become tranſparent, and at length appear like very fine black gauze.—The males no ſooner come to maturity than they copulate with the females; in which act they are readily diſcovered, as they remain in conjunction a conſiderable time, and are not eaſily diſturbed. The commerce between them continues the whole month of October, and may be obſerved at all times of the day, tho' I have found it moſt frequent about noon; eſpecially if the weather be moderately warm, and the ſun overcaſt. The females, in a day or two after their intercourſe with the males, I have obſerved to lay eggs; which they uſually do near the buds, when they are left to their own choice. Where there are a number crowded together, they of courſe interfere with each other, in which caſe they will frequently depoſit their eggs on other parts of the branches, or even on the ſpines with which they are beſet." Theſe inſects are found in great numbers, not only on the ſtems and leaves, but even upon roots of many trees and plants. See Plate XIII. fig. 7. Thoſe trees which are moſt loaded with the inſects, as already obſerved, ſuffer greatly from them. The plant lice thruſt their ſharp pointed roſtrum into the ſubſtance of the leaf to draw out their ſuſtenance, which warps the ſtems and leaves, and occaſions in the latter cavities underneath, and ſwellings above; nay, even in ſome, a kind of hollow gall filled with inſects, as is often ſeen on elm leaves. It appears aſtoniſhing that the ſlight puncture of ſo ſmall an animal ſhould ſo greatly diſfigure a plant: but it muſt be remembered, that plant lice always live in numerous aſſociations, which increaſe viſibly by the prodigious fruitfulneſs of thoſe inſects; ſo that although each puncture be ſlight, yet the number of them is ſo great, and ſo reiterated, that it is no longer a wonder the leaves ſhould be disfigured. Lovers of gardening and plants are extremely anxious to free and cleanſe their trees from this vermin; but their care often proves unavailing, the inſects are ſo fruitful that they ſoon produce a freſh colony. The beſt and ſureſt method of extirpating them, is to put on the trees infeſted with them ſome larvæ of the plant louſe lion, or aphidivorous flies. (See Coccinella, Ichneumon, Hemerobius, &c.) For thoſe voracious larvæ deſtroy every day a great number of theſe inſects, and that with ſo much the more facility, as the latter remain quiet and motionleſs in the neighbourhood of theſe dangerous enemies, who range over heaps of plant lice which they gradually diminiſh and extirpate.

APHONY, *n. s.* a loſs of ſpeech.

APHORISM, *n. s.* a maxim; a precept contracted in a ſhort ſentence; an unconnected poſition. The term is chiefly uſed in medicine and law. We ſay, the aphoriſms of Hippocrates, of Sanctorius, of Boerhaave, aphoriſms of the civil law, &c. It is ſometimes uſed in divinity too.—There is a work entitled *Aphorisms of Faith*.

APHRODISA, *n. s.* venereal intercourſe. It is alſo uſed for the age of venery, more frequently denominated puberty.

Aphrodisiacs, amongſt phyſicians denote medicines proper to promote an inclination to venery.

APHTHÆ, in medicine, ſmall round, and ſuperficial ulcers ariſing in the mouth, particularly in infants at the breaſt. For the prevention and cure of this diſorder, ſee Midwifery.

APIARY, *n. s.* the place where bees are kept. For a ſituation moſt proper for an apiary, ſee Bee.

APICES *of a flower*, the ſame as the antheræ. See Antheræ.

APIECE, *adv.* to the part or ſhare of each.

APIS, in aſtronomy, a Southern conſtellation, called alſo Musca. See Astronomy.

Apis, the bee, in zoology, a genus of inſects belonging to the order of inſecta hymenoptera. The mouth is furniſhed with two jaws, and a proboſcis infolded in a double ſheath; the wings are four in number, the two foremoſt covering thoſe behind when at reſt: In the anus or tail of the female and working bees, there is a hidden ſting.—Theſe inſects are diſtinguiſhed into ſeveral ſpecies, each of which has its peculiar genius, talent, manners, and diſpoſition. Variety prevails in the order of their architecture, and in the nature of their materials. Some live in ſociety, and ſhare the toils; ſuch are the common bee. Others dwell and work in ſolitude, building the cradles of their families: as the leaf cutter bee does with the roſe tree leaf; the upholſterer with the gaudy tapeſtry of the corn roſe; the maſon bee with a plaſter, the wood piercer with ſaw duſt. All are employed in their little hermitage, with the care of providing for their offspring.—The ſpecies enumerated by Linnæus, are no fewer than 55; of which the following are the moſt remarkable: 1. The BRASILIANORUM, or pale red hairy bee, with the baſis of the thighs black.—This is a very large bee, every where covered with a teſtaceous ſkin, and is a native of America. 2. The CENTUNCULARIS, leaf cutter, or black bee, having its belly covered with yellow down. The neſts of this ſpecies are made of leaves, curiouſly plaited in the form of a mat or quilt. There are ſeveral varieties of the leaf cutting bees, all equally induſtrious. They dig into the ground, and build their neſts, of which ſome have the form and ſize of thimbles inſerted one within another, others the ſize and ſhape of gooſe quills. Theſe neſts are compoſed of pieces of leaves. Each ſort of bees cut into its own materials; ſome the roſe tree leaf; others the horſe cheſnut. A careful obſerver may diſcover roſe tree leaves, cut as it were; with a pinking iron; and there he may procure himſelf the pleaſure of ſeeing with what dexterity a bee, deſtitute of any mathematical inſtrument, cuts out a circular piece, fit to be either the bottom or the lid of one of thoſe neſts; others it cuts out into ovals and ſemi-ovals, which form the ſides of the neſt, into each of which it depoſits one egg, with ready prepared victuals. Plate VI. fig. 4.—3. The Muscorum, or yellow hairy bee with a white belly, builds in moſſy grounds. The ſkill diſplayed by theſe builders is admirable. In order to enjoy the pleaſure of ſeeing their operations, let the neſt be taken to pieces, and the moſs conveyed to a diſtance. The bees will be ſeen to form themſelves into a chain, from their neſt to the place where the moſs has been laid. The foremoſt lays hold of ſome with her teeth, clears it bit by bit with her feet (which circumſtance has alſo procured them the name of *carding bees*,) then, by the help of her feet, ſhe drives the unravelled moſs under her belly; the ſecond, in like manner, puſhes it on to the third. Thus there is formed an uninterrupted chain of moſs, which is wrought and interwoven with the greateſt dexterity by thoſe which abide by the neſt; and that their neſt may not be the ſport of the winds, and may ſhelter them from rain, they throw an arch over it, which they compoſe with a kind of wax, tenaceous though thin in ſubſtance, which is neither the unwrought bees wax nor the real wax. Diſſolved in oil of turpentine, it may be uſed in taking off impreſſions. 4. The Terrestris is black and hairy, with a white belt round the breaſt, and a white anus; it builds its neſt very deep in the earth. 5. The Cariosa, which builds in the hollows of rotten trees. 6. The Melli-

FICA, or domeſtic honey-bee. But the particulars concerning this valuable ſpecies are ſo numerous and intereſting as to require a ſeparate article for their detail; which the reader will therefore find at due length under the Engliſh name, BEE.

APISH, *adj.* 1. Having the qualities of an ape; imitative.—2. Foppiſh; affected.—3. Silly; trifling.—4. Wanton; playful.

APISHLY, *adj*, in an apiſh manner; foppiſhly.

APISHNESS, *n. s.* mimicry; foppery.

APITPAT, *adv.* with quick palpitation.

APIUM, PARSLEY: a genus of the digynia order, belonging to the pentandria claſs of plants. There are only two ſpecies, viz. the PETROSELINUM, or common parſley, and the GRAVEOLENS or ſmallage. The roots and ſeeds of the *petroſelinum* are uſed in medicine. The root of parſley is one of the five aperient roots, and in this intention is ſometimes made an ingredient in apozems and diet drinks; but if liberally uſed, it is apt to occaſion flatulencies; and thus, by diſtending the viſcera, produces a contrary effect to that intended by it. The roots of *ſmallage* are alſo in the number of aperient roots, and have been ſometimes preſcribed as an ingredient in aperient apozems and diet-drinks, but are at preſent diſregarded. The common parſley is alſo reckoned an effectual cure for the rot in ſheep, provided they are fed with it twice a-week for two or three hours each time; but hares and rabbits are ſo fond of this herb, that they will come from a great diſtance to feed upon it: and in the countries where theſe animals abound, they will deſtroy it if not very ſecurely fenced againſt them; ſo that whoever has a mind to have plenty of hares in their fields, may draw them from all parts of the country by cultivating parſley.

APOCALYPSE, *n. s.* REVELATION, the name of one of the ſacred books of the New Teſtament, containing revelations of ſeveral important events and doctrines of Chriſtianity. This book, according to Irenæus, was written about the year of Chriſt 96, in the iſland of Patmos, whither St. John had been baniſhed by the emperor Domitian. But Sir Iſaac Newton places the writing of it earlier, viz. in the time of Nero. Some attribute this book to the arch-heretic Cerinthus: but the ancients unanimouſly aſcribe it to John, the ſon of Zebedee, and brother of James; whom the Greek fathers call the Divine, by way of eminence, to diſtinguiſh him from John the Baptiſt, &c. This book has not, at all times, been eſteemed canonical. There were many churches in Greece, as St. Jerome informs us, which did not receive it: neither is it in the catalogue of canonical books prepared by the council of Laodicea, nor in that of St. Cyril of Jeruſalem; but Juſtin, Irenæus, Origen, Cyprian, Clemens of Alexandria, Tertullian, and all the fathers of the fourth, fifth, and the following centuries, quote the Revelation as a book then acknowledged to be canonical. The Alogians, Marcionites, Cerdonians, and Luther himſelf, rejected this book; but the Proteſtants have forſaken Luther in this particular; and Beza has ſtrenuouſly maintained againſt his objections, that the Apocalypſe is authentic and canonical. Sir Iſaac Newton, in ſpeaking of the Apocalypſe, ſays, "It is a part of this prophecy, that it ſhould not be underſtood before the laſt age of the world; and therefore it makes for the credit of the prophecy, that it is not yet underſtood. The folly of interpreters has been to foretel times and things by this prophecy, as if God deſigned to make them prophets! By this raſhneſs they have not only expoſed themſelves, but brought the prophecy alſo into contempt. The deſign of God was much otherwiſe: He gave this and the prophecies of the Old Teſtament, not to gratify men's curioſities, by enabling them to foreknow things: but that, after they were fulfilled, they might be interpreted by the events; and his own providence, not the interpreter's wiſdom, be then manifeſted thereby to the world. And there is already ſo much of the prophecy fulfilled, that as many as will take pains in this ſtudy may ſee ſufficient inſtances of God's providence."

APOCRYPHA, or APOCRYPHAL BOOKS, are not admitted into the canon of ſcripture, being either ſpurious, or at leaſt not acknowledged as divine. The word is Greek, and derived from *apo* and *krupto*, to *hide* or *conceal*; becauſe the origin of ſuch books was unknown, or becauſe they contain ſome myſteries not fit to be known. When the Jews publiſhed their ſacred books, they gave the appellations of *canonical* and *divine* only to ſuch as they then made public: ſuch as were ſtill retained in their archives they called *apocryphal*, for no other reaſon but becauſe they were concealed, or not made public; ſo that they might be really ſacred and divine, though not promulged as ſuch. Thus, in reſpect of the Bible, all books are called *apocryphal* which were not inſerted in the Jewiſh canon of ſcripture. Voſſius obſerves, that, with regard to the ſacred books, none are to be accounted apocryphal, except ſuch as had neither been admitted into the ſynagogue nor the church, ſo as to be added to the canon, and read in public. The Proteſtants not only reckon thoſe books apocryphal which are eſteemed ſuch in the church of Rome, as the prayer of Manaſſeh king of Judah, the IIId and IVth books of Eſdras, St. Barnabas's epiſtle, the book of Hermus, the addition at the end of Job, and the 151ſt pſalm; but alſo Tobit, Judith, the reſt of Eſther, the Wiſdom of Solomon, Baruch, Eccleſiaſticus, the Song of the Three Children, the ſtory of Suſannah, and of Bel and the Dragon, and the Iſt and IId books of Maccabees. It is now pretended that theſe books were not received by the Jews, or ſo much as known to them. But this is not credible. They ſeem, moſt of them, to have been written by Jews. But none of the writers of the New Teſtament cite or mention them: neither Philo nor Joſephus ſpeak of them. The Chriſtian church was for ſome ages a ſtranger to them. Origen, Athanaſius, Hilary, Cyril of Jeruſalem, and all the orthodox writers, who have given catalogues of the canonical books of ſcripture, unanimouſly concur in rejecting theſe out of the canon. The Proteſtants acknowledge ſuch books of ſcripture only to be canonical as were eſteemed to be ſo in the firſt ages of the church; ſuch as are cited by the earlieſt writers among the Chriſtians of divine authority, and after the moſt diligent enquiry were received and judged to be ſo, by the council of Laodicea. The apocryphal books, however, according to the ſixth article of the church of England, are to be read for example of life and inſtruction of manners; but it doth not apply them to eſtabliſh any doctrine: nor is even this uſe made of them, by the other reformed churches.

APOCRYPHAL, *adj.* 1. Not canonical; of uncertain authority.—2. Contained in the apocrypha.

APODES, in the Linnæan ſyſtem, the name of the firſt order of fiſhes, or thoſe which have no belly fins. See ZOOLOGY.

APOGEE, *n. s.* a point in the heavens, in which the ſun, or a planet, is at the greateſt diſtance poſſible from the earth in its whole revolution. The ancient aſtronomers regarding the earth as the centre of the ſyſtem, chiefly regarded the apogæon and perigæon, which the moderns, making the ſun the centre, change for the aphelion and perihelion.

APOLLO, in mythology, a pagan deity worſhipped by the Greeks and Romans. He was the God of light and poetry, and was regarded as the inventor and patron of the fine arts. He had a famous temple at Delphos, where his oracles were in great eſtimation. Apollo is principally diſtinguiſhed in ancient ſtatues, by the beauty of his face, and the gracefulneſs of his figure; accordingly Virgil calls him the beautiful, and Tibellus the well ſhaped God. Apollo had a variety of names, either derived from his principal attributes, or the chief places where he was worſhipped. He was called the *Healer* from his enlivening warmth and cheering influence; *Pæan*, from the peſtilential heats: to ſignify the former, the ancients placed the graces in his right hand; and for the latter, a bow and arrows in his left: *Nomius*, or the ſhepherd, from his fertilizing the earth, and thence ſuſtaining the animal creation: *Delius*, from his rendering all things manifeſt: *Pythius*, from his victory over Python: *Lycias*, *Phœbus*, and *Phaneta*, from his purity and ſplendor. As Apollo is almoſt always confounded by the Greeks with the ſun, it is no wonder that he ſhould be dignified with ſo many attributes. It was natural to adore the moſt glorious object in nature, whoſe influence is felt by all creation, and ſeen by every animated part of it, as the fountain of light, heat, and life. The power of healing diſeaſes being chiefly given by the ancients to medicinal plants and vegetable productions, it was natural to exalt into a divinity the viſible cauſe of their growth. Hence he was alſo ſtyled the *God of Physic;* and that external heat which cheers and invigorates all nature, being transferred from the human body to the mind, gave riſe to the idea of all mental efferveſcence coming from this god; hence, likewiſe, poets, prophets, and muſicians, are ſaid to be *Numine afflati*, inſpired by Apollo. To the other perfections of this divinity the poets have likewiſe added beauty, grace, and the art of captivating the ear and the heart, no leſs by the ſweetneſs of his eloquence, than by the melodious ſounds of his lyre. There can be no doubt that Apollo was more generally revered in the Pagan world than any other deity; having, in almoſt every region of it, temples, oracles, and feſtivals, as innumerable as his attributes. The wolf and hawk were conſecrated to him, as ſymbols of his piercing eyes; the crow and the raven, becauſe theſe birds were ſuppoſed to have by inſtinct the faculty of prediction; the laurel, from a perſuaſion that thoſe who ſlept with ſome branches of that tree under their heads received certain vapours, which enabled them to propheſy. The cock was conſecrated to him, becauſe by his crowing he announces the riſing of the ſun; and the graſshopper on account of his ſinging faculty, which was ſuppoſed to do honour to the god of muſic. The ſwan was regarded by the ancients as a bird ſacred to Apollo in two capacities; firſt, as being, like the crow and raven, gifted with the ſpirit of prediction; and, 2dly, for his extraordinary vocal powers. The ſweetneſs of his ſong, eſpecially at the approach of death, was not only extolled by all the poets of antiquity, but by hiſtorians, philoſophers, and ſages; and to call a great writer the *swan* of his age and nation, was a full acknowledgment of his ſuperiority.

APOLLO BELVIDERE, one in the firſt claſs of the ancient ſtatues. The excellence of this ſtatue conſiſts in the expreſſion of ſomething divine, whereas the reſt excel only in things that are common to men. This ſtatue may perhaps juſtly claim the preference, even in the ſuperior and diſtinguiſhed claſs of the beſt remains of all antiquity. There are about 20 ancient ſtatues which the moderns have diſcovered that are referred to the firſt claſs, and conſidered each as the chief beauty in its kind.

APOLOGETICALLY, *adv.* in the way of defence or excuſe.

APOLOGETICAL, } *adj.* that which is ſaid in defence
APOLOGETIC, } of any thing or perſon.

APOLOGIES FOR CHRISTIANITY. Although Chriſtianity is in itſelf ſo excellent, as, properly ſpeaking, to require no apology, yet the infidelity and wickedneſs of mankind have rendered apologies for it neceſſary in all ages, ſince its firſt appearance, and in none perhaps more than in the preſent. The principal ancient apologies in favour of the Chriſtians are thoſe of Quadratus, written about the year 124, and addreſſed to the emperor Adrian; of Ariſtides, written ſoon after the former; two of Juſtin Martyr, one of which was written in the year 150, and addreſſed to Antonine, and the other in 166, addreſſed to the Roman ſenate. It would be endleſs to enumerate the various works which have been publiſhed in modern times, that might be claſſed under this title; but one of the laſt and beſt that expreſsly bears it, is the Biſhop of Landaff's APOLOGY *for the* BIBLE, *in a series of Letters addressed to* THOMAS PAINE, a work which we would earneſtly recommend as a moſt complete and ſatisfactory refutation of Mr. Paine's *Age of Reason*, and as proper to be peruſed by all, who wiſh to diſtinguiſh truth from falſehood, and to have their minds properly fortified againſt the impreſſions that are too apt to be made by the ſophiſtry of modern infidels.

APOLOGIST, *n. s.* he who makes an apology.

To APOLOGIZE, *v. n.* to plead in favour of.

APOLOGUE, *n. s.* fable; ſtory contrived to teach ſome moral truth. The only difference between a parable and an apologue is, that the former, being drawn from what paſſes among mankind, requires probability in the narration; whereas the apologue, being taken from the ſuppoſed actions of brutes, or even of things inanimate, is not tied down to the ſtrict rules of probability. Æſop's fables are a model of this kind of writing.

APOLOGY, *n. s.* defence; excuſe. See APOLOGIES.

APOPHLEGMATIC, *n. s.* that which has the quality of drawing away phlegm.

APOPHLEGMATISM, *n. s.* a medicine of which the intention is to draw phlegm from the blood.

APOPHTHEGM, *n. s.* a remarkable ſaying; a valuable maxim uttered on ſome ſudden occaſion.

APOPHYSIS, *n. s.* the prominent parts of ſome bones; the ſame as proceſs —It differs from an epiphyſis, as it is a continuance of the bone itſelf; whereas the latter is ſomewhat adhering to a bone, and of which it is not properly a part. See ANATOMY.

APOPLECTICAL, or Apoplectic, *adj.* relating to an apoplexy.

APOPLEXY, *n. s.* a ſudden deprivation of all internal and external ſenſation, and of all motion, unleſs of the heart and thorax. The cauſe is generally a repletion, and indicates evacuation, joined with ſtimuli. For deſcription, cauſes, and cure of this diſeaſe, ſee Medicine.

APOSTACY, *n. s.* departure from what a man has profeſſed: it is generally applied to religion. The primitive Chriſtian church diſtinguiſhed ſeveral kinds of apoſtacy. The firſt, of thoſe who went entirely from Chriſtianity to Judaiſm; the ſecond, of thoſe who mingled Judaiſm and Chriſtianity together; and the third, of thoſe who complied ſo far with the Jews, as to communicate with them, in many of their unlawful practices, without making a formal profeſſion of their religion. But the fourth ſort was of thoſe, who, after having been ſome time Chriſtians, voluntarily relapſed into Paganiſm. The perverſion of a Chriſtian to Judaiſm, Paganiſm, or other falſe religion, was puniſhed by the emperors Conſtantius and Julian with confiſcation of goods; to which the emperors Theodoſius and Valentinian added capital puniſhment, in caſe the apoſtate endeavoured to pervert others. A puniſhment too ſevere for any temporal laws to inflict; and yet we find by Bracton, that in his time apoſtates were in Great-Britain, to be burnt to death. Doubtleſs, the preſervation of Chriſtianity, as a national religion, is, abſtracted from its own intrinſic truth, of the utmoſt conſequence to the civil ſtate; which a ſingle inſtance will ſufficiently demonſtrate. The belief of a future ſtate of rewards and puniſhments, the entertaining juſt ideas of the moral attributes of the Supreme Being, and a firm perſuaſion that he ſuperintends, and will finally compenſate every action in human life (all which are clearly revealed in the doctrines, and forcibly inculcated by the precepts, of our ſaviour Chriſt,) theſe are the grand foundation of all judicial oaths; which call God to witneſs the truth of thoſe facts, which perhaps may be only known to him and the party atteſting: all moral evidence, therefore, all confidence in human veracity, muſt be weakened by apoſtacy, and overthrown by total infidelity.—Wherefore all affronts on Chriſtianity, or endeavours to depreciate its efficacy, in thoſe who have once profeſſed it, are highly deſerving of cenſure. But yet the loſs of life is a heavier penalty than the offence, taken in a civil light, deſerves; and, taken in a ſpiritual light, the laws have no juriſdiction over it.

APOSTATE, *n. s.* one who has forſaken his profeſſion; generally applied to one that has left his religion.

To APOSTATIZE, *v. n.* to forſake one's profeſſion.

APOTEME, Apostume, *n. s.* a hollow ſwelling, filled with purulent matter; an abſceſs.

APOSTLE, *n. s.* properly ſignifies, a meſſenger or perſon ſent by another upon ſome buſineſs, and hence by way of eminence, denotes one of the diſciples commiſſioned by Jeſus Chriſt to preach the goſpel. It is particularly applied to them, whom our Saviour deputed to preach the goſpel. Our bleſſed Lord ſelected twelve of his diſciples to be apoſtles. There are various conjectures, as to the reaſon of his chooſing exactly *twelve*. The moſt probable is, that it might be in alluſion to the 12 patriarchs, as the founders of their ſeveral tribes; or to the 12 chief rulers of thoſe tribes, of which the body of the Jewiſh nation conſiſted. This opinion ſeems to be countenanced, by what our Saviour tells his apoſtles, that, "when the Son of man ſhall ſit in the throne of his glory, *they* ſhall alſo ſit upon 12 thrones, judging the 12 tribes of Iſrael." Our Lord's firſt commiſſion to his apoſtles, was in the third year of his public miniſtry, about eight months after their election; at which time he ſent them out by two and two. They were to make no proviſion of money for their ſubſiſtence, in their journey, but to expect it from thoſe to whom they preached; to declare, that the kingdom of heaven, or the Meſſiah, was at hand; to confirm their doctrine by miracles; to avoid going either to the Gentiles or to the Samaritans, and to confine their preaching to the people of Iſrael. In obedience to their Maſter, the apoſtles went into all the parts of Paleſtine, inhabited by the Jews, preaching the goſpel, and working miracles. The evangelical hiſtory is ſilent as to the particular circumſtances attending this firſt preaching of the apoſtles; and only informs us, that they returned, and told their Maſter of all that they had done. Their ſecond commiſſion, juſt before our Lord's aſcenſion into heaven, was of a more extenſive nature. They were now ordered to "go and teach ALL nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghoſt." Accordingly, they began publicly, after our Lord's aſcenſion, to exerciſe the office of their miniſtry, working miracles daily, in proof of their miſſion, and making great numbers of converts to the Chriſtian faith. This alarmed the Jewiſh Sanhedrim; whereupon the apoſtles were apprehended, and, being examined before the high prieſt and elders, were commanded not to preach any more in the name of Chriſt.—But this injunction did not terrify them from perſiſting in their duty; for they continued daily, in the temple, and private houſes, teaching and preaching the goſpel. After the apoſtles had exerciſed their miniſtry for 12 years in Judea, they reſolved to diſperſe themſelves in different parts of the world, and agreed to determine by lot what parts each ſhould take. According to this diviſion, St. Peter went into Pontus, Galatia, and ſome places adjacent; St. *Andrew* into the vaſt northern countries of Scythia and Sogdiana; St. John into the Leſſer Aſia; St. Philip into the Upper Aſia and ſome parts of Scythia and Colchis; St. Bartholomew into Arabia Felix; St. Matthew travelled into Chaldea, Perſia, and Parthia; St. Thomas into Hyrcania, Bactria, and India; St. James the leſs continued in Jeruſalem, of which church he was biſhop, ruling elder, or chief miniſter; St. Simon travelled into Egypt, Cyrene, Libya, and Mauritania; St. Jude, ſirnamed Thaddeus, or Lebbeus, into Syria and Meſopotamia; and St. Matthias, who was choſen in the room of the traitor Judas Iſcariot, into Cappadocia and Colchis. Thus, by the diſperſion of the apoſtles, Chriſtianity was very early planted in a great many parts of the world. We have but very ſhort and imperfect accounts of their travels and actions. To qualify the apoſtles for the arduous taſk of converting the world to the Chriſtian religion, they were miraculouſly enabled to ſpeak the languages of the ſeveral nations to whom they were to preach; and were endowed with the power of working miracles, in confirmation of the doctrines they taught; gifts which were unneceſſary, and therefore ceaſed, in the after ages of the church. St. Paul is frequently called the apoſtle of the Gentiles, becauſe his miniſtry was chiefly made uſe of for the converſion of the

Gentile world, as that of St. Peter was for the Jews, who is therefore ſtyled the apoſtle of the circumciſion.

Apostles creed. See Creed.

APOSTLESHIP, *n. s.* the office or dignity of an apoſtle.

APOSTOLIC, }
APOSTOLICAL, } ſomething that relates to the apoſtles, or deſcends from them. Thus we ſay, the *apoſtolic* age, *apoſtolical* doctrine, &c. Apoſtolic, in the primitive church, was an appellation given to all ſuch churches as were founded by the apoſtles; and even to the biſhops of thoſe churches, as being the reputed ſucceſſors of the apoſtles.—Theſe were four, viz. Rome, Alexandria, Antioch, and Jeruſalem. In after times, other churches aſſumed the ſame quality, on account, principally, of the conformity of their doctrine with that of the churches which were apoſtolical by foundation, and becauſe all biſhops held themſelves ſucceſſors of the apoſtles, or acted in their dioceſes with the authority of apoſtles. In progreſs of time, the biſhop of Rome growing in power above the reſt, and the three patriarchates of Alexandria, Antioch, and Jeruſalem, falling into the hands of the Saracens, the title *apoſtolical* was reſtricted to the pope and his church alone. Though ſome of the popes and St. Gregory the Great, not contented to hold the title by this tenure, began, at length, to inſiſt, that it belonged to them by another and peculiar right, as being the ſucceſſors of St. Peter. The country of Rheims, in 1049, declared that the pope was the ſole apoſtolical primate of the univerſal church. And hence a great number of apoſtolicals; *apoſtolical* ſee, *apoſtolical* nuncio, *apoſtolical* notary, *apoſtolical* brief, *apoſtolical* chamber, *apoſtolical* vicar, &c.

Apostolical fathers is an appellation uſually given to the writers of the firſt century, who employed their pens in the cauſe of Chriſtianity. Of theſe writers, Cotelerius, and after him Le Clerc, have publiſhed a collection in two volumes, accompanied both with their own annotations, and the remarks of other learned men.

APOSTOLICALLY, *adv.* in the manner of the apoſtles.

APOSTROPHE, *n. s.* 1. In rhetorick, a diverſion of ſpeech to another perſon than the ſpeech appointed did intend or require.—2. In grammar, the contraction of a word by the uſe of a comma, as, *tho'* for *though*. Apoſtrophe in grammar, is alſo uſed as a ſign of the genitive, or poſſeſſive caſe, according to an opinion long received, that the *'s*, is a contraction of *his*, as the *ſoldier's valour,* for the *ſoldier his valour*; but this cannot be the true original, becauſe *'s* is put to female nouns, as the *woman's beauty*, and to collective nouns, the *people's folly*. The affectation of frequent apoſtrophes, ſo uſual among ſome late Engliſh writers, is a great abuſe. In proſe, apoſtrophes are indefenſible, (except in contracting the poſſeſſive pronoun) and tend to vitiate the ſenſe. They are uſeful, however, in poetry, to reduce a line to the proper meaſure.

Apostrophe, in rhetoric, (above defined,) is, in boldneſs, a degree lower than the addreſs to perſonified objects (See Personification,) ſince it requires a leſs effort of imagination to ſuppoſe perſons preſent, who are dead or abſent, than to imitate inſenſible beings and direct our diſcourſe to them. The Poems of Oſſian abound with the moſt beautiful inſtances of this figure. "Weep on the rocks of roaring winds, O Maid of Iniſtore! Bend thy fair head over the waves, thou fairer than the ghoſt of the hills, when it moves in a ſun beam at noon over the ſilence of Morven: He is fallen! Thy youth is low; pale beneath the ſword of Cuchullin!"

APOSTROPHIZE, *v. n.* to addreſs by an apoſtrope.

APOTHECARY, *n. s.* 1. A man whoſe employment is to keep medicines for ſale.—2. One who practices the art of pharmacy.

APOTHEGM, *n. s.* a remarkable ſaying.

APOTHEOSIS, *n. s.* in antiquity, an heathen ceremony, whereby their emperors and great men were placed among the gods. After the apotheoſis, which they alſo called deification and conſecration, temples, altars and images were erected to the new deity: ſacrifices, &c. were offered and colleges of prieſts inſtituted.—It was one of the doctrines of Pythagoras which he had borrowed from the Chaldees, that virtuous perſons after their death were raiſed to the order of the gods. And hence the ancients deified all the inventors of things uſeful to mankind; and thoſe who had done any important ſervice to the commonwealth.—Tiberius propoſed to the Roman ſenate the apotheoſis of Jeſus Chriſt, as is related by Euſebius, Tertullian, and Chryſoſtom; but the ſenate, though generally very obſequious to the emperor, and extremely ready to adopt the gods of even conquered nations, did not agree to this propoſal, which was fortunate for Chriſtianity, as modern infidels would have alledged, that the Chriſtians had only adopted one of the Roman idols and rejected the reſt, and would probably have accounted for the early and rapid ſucceſs of the goſpel, by the imperial influence of Tiberius and his ſucceſſors.—Juvenal rallying the frequent apotheoſes, introduces poor Atlas, complaining that he was ready to ſink under the burden of ſo many gods as were every day added to the heavens. Seneca ridicules the apotheoſis of Claudius with admirable humour. See Deification.

APOZEM, *n. s.* a decoction; an infuſion made by boiling ingredients. See Decoction.

To **APPAL,** *v. a.* to fright; to ſtrike with ſudden fear; to depreſs; to diſcourage.

APPALLACHIAN mountains. See allegany mountains.

APPALEMENT, *n. s.* depreſſion; diſcouragement; impreſſion of fear.

APPARATUS, *n. s.* things provided as means to any certain end, as the tools of a trade; the furniture of a houſe; ammunition for war; equipage; ſhow.

APPAREL, *n. s.* 1. Dreſs; veſture.—2. External habiliments.

To **Apparel,** *v. a.* 1. To dreſs; to clothe.—2. To adorn with dreſs.—3. To cover or deck as with dreſs.

APPARENT, *adj.* plain, indubitable, that, which is viſible to the eye or the underſtanding.—Among aſtronomers and mathematicians, it denotes things as they appear to us, in contradiſtinction from real or true; thus we ſay, the apparent diameter, diſtance, magnitude, place, figure, &c. of bodies,

Apparent conjunction of the planets is, when a right line, ſuppoſed to be drawn through the centre of two planets, does not paſs thro' the centre of the earth, but thro' the eye of the ſpectator.

Apparent heirs, in law, are thoſe, whoſe right of inheritance is indefeaſible, provided they outlive the anceſtor;

as the eldeſt ſon or his iſſue, who muſt by the courſe of the common law be heirs to the father whenever he happens to die. Heirs *preſumptive* are thoſe, who, if the anceſtor ſhould die immediately, would in the preſent circumſtance of things be his heirs; but whoſe right of inheritance may be defeated by the contingency of ſome nearer heir being born; as a brother or nephew, whoſe preſumptive ſucceſſion may be deſtroyed by the birth of a child; or daughter, whoſe preſent hopes may be hereafter cut off by the birth of a ſon. Nay, even if the eſtate hath deſcended, by the death of the owner, to ſuch brother, or nephew, or daughter; in the former caſes, the eſtate ſhall be diveſted and taken away by the birth of a poſthumous child: and, in the latter, it ſhall alſo be totally diveſted by the birth of a poſthumous ſon.

APPARENTLY, *adv.* evidently; openly.

APPARITION, *n. s.* in a general ſenſe denotes ſimply the appearance of a thing. In a more limited ſenſe it is uſed for a ſpectre. Several inſtances of apparitions occur in the Bible; that of Samuel, raiſed by the witch of Endor, has occaſioned great diſputes. We find great controverſies among authors, in relation to the reality, the exiſtence or non-exiſtence, the poſſibility or impoſſibility, of apparitions. The Chaldeans, the Jews, and other nations, have been the ſteady aſſerters of the belief of apparitions. The denial of ſpirits and apparitions is by ſome made one of the marks of infidelity, if not of atheiſm. Many of the apparitions we are told of in writers, are doubtleſs mere deluſions of the ſenſe; many others are fictitious, contrived merely to amuſe, or anſwer ſome purpoſe. Apparitions, it is certain, are machines, that on occaſion have been of good ſervice both to generals, to miniſters of ſtate, to prieſts and others. Partial darkneſs, or obſcurity, are the moſt powerful means by which the ſight is deceived; night is therefore the proper ſeaſon for apparitions. Indeed the ſtate of the mind at that time, prepares it for the admiſſion of theſe deluſions of the imagination. The fear and caution which muſt be obſerved in the night; the opportunity it affords for ambuſcades and aſſaſſinations; depriving us of ſociety, and cutting off many pleaſing trains of ideas, which objects in the light never fail to introduce, are all circumſtances of terror; and perhaps, on the whole, ſo much of our happineſs depends upon our ſenſes, that the deprivation of any one may be attended with proportionable horror and uneaſineſs. The notions entertained by the ancients reſpecting the ſoul, may receive ſome illuſtrations from theſe principles. In dark or twilight, the imagination frequently transforms an animate body into a human figure; on approaching, the ſame appearance is not to be found: hence they ſometimes fancied they ſaw their anceſtors; but not finding the reality, diſtinguiſhed theſe illuſions by the name of *ſhades*.—Many of theſe fabulous narrations might originate from dreams. There are times of ſlumber when we are not in any degree ſenſible of being aſleep. On this principle, Hobbes has ingeniouſly accounted for the ſpectre which is ſaid to have appeared to Brutus. "We read," ſays he, "of M. Brutus, that at Philippi, the night before he gave battle to Auguſtus Cæſar, he ſaw a fearful apparition, which is commonly related by hiſtorians as a viſion; but, conſidering the circumſtances, one may eaſily judge it to have been but a ſhort dream. For ſitting in his tent, penſive and troubled with the horror of his raſh act, it was not hard for him, ſlumbering in the cold, to dream of that which moſt affrighted him; which fear, as by degrees it made him wake, ſo it muſt needs make the apparition by degrees to vaniſh; and having no aſſurance that he ſlept, he could have no cauſe to think it a dream, or any thing but a viſion." The well known ſtory told by Clarendon, of the apparition of the Duke of Buckingham's father will admit of a ſimilar ſolution. There was no man in the kingdom ſo much the ſubject of diſcourſe as the Duke; and from the corruption of his character, he was very likely to fall a ſacrifice to the enthuſiaſm of the times. Sir George Villiers is ſaid to have appeared to a man at midnight: therefore there is the greateſt probability that the man is aſleep: and the dream affrighted him, made a ſtrong impreſſion, and was likely to be repeated.

To APPEACH, *v. a.* 1. To accuſe.—2. To cenſure; to reproach.

APPEACHMENT, *n. s.* accuſation.

APPEAL, *n. s.* 1. An *appeal* is a provocation *from* an inferior *to* a ſuperior judge.—2. In the common law.—An accuſation.—3. A ſummons to anſwer a charge.—4. A call upon any as witneſs.—Appeal in law, the removal of a cauſe from an inferior to a ſuperior court or judge, when a perſon thinks himſelf aggrieved by the ſentence of the inferior judge.

To Appeal, *v. n.* 1. To transfer a cauſe from one to another.—2. To refer to another as judge.—3. To call another as witneſs.

APPEALANT, *n. s.* he who appeals.

To APPEAR, *v. n.* To be in ſight; to be viſible.—2. To become viſible as a ſpirit.—3. To ſtand in the preſence of ſome ſuperior.—4. To be the object of obſervation—5. To exhibit one's ſelf before a court of juſtice.—6. To be made clear by evidence.—7. To ſeem in oppoſition to reality.—8. To be plain beyond diſpute.

APPEARANCE, *n. s.* 1. The act of coming into ſight.—2. The thing ſeen.—3. Phenomena; that *quality of* any thing which is viſible.—4. Semblance; not reality.—5. Outſide ſhow.—6. Entry into a place or company.—7. Apparition; ſupernatural viſibility.—8. Exhibition of the perſon to a court.—9. Open circumſtance of a caſe.—10. Preſence; mien.—11. Probability; likelihood.

Appearance, in law, ſignifies a defendant's filing a common or ſpecial bail, on any proceſs iſſued out of a court of Judicature. See Bail.

Appearance, in perſpective, the repreſentation or projection of a figure, body, or like object, upon the perſpective plane.

Appearances, in aſtronomy, &c. are more uſually called *phenomena* and *phaſes*. In optics, we uſe the term *Direct appearance* for the view or ſight of any object by direct rays, without either refraction or reflection.

APPEARER, *n. s.* the perſon who appears.

APPEASABLE, *adj.* reconcileable.

To APPEASE, *v. a.* 1. To quiet; to put into a ſtate of peace.—2. To pacify; to reconcile.

APPEASEMENT, *n. s.* a ſtate of peace.

APPEASER, *n. s.* he who pacifies; he who quiets diſturbances.

APPELLANT, *n. s.* 1. A challenger.—2. One who appeals from a lower to a higher power.

APPELLATE, *n. s.* the perſon appealed againeſt

APPELLATION, *n. s.* the name, by which any thing is known or diſtinguiſhed, when ſpoken of. Nothing can be more foreign to the original meaning of many words and proper names, than their preſent appellations, frequently owing to the hiſtory of thoſe things being forgotten, or an ignorance of the language in which they were expreſſed. Who, for inſtance, would ſuppoſe that the head on the French coaſt, near Calais, called by the Britiſh ſeamen *Blackness*, could be ſo entitled from its French name of *Blanc Nez*, or, the *White* Head-land? Or who, when the crier of a court bawls out, O Yes! O Yes! would dream, that it was a proclamation, commanding ſilence, being a corruption of the French word *Oyez*, *Listen*, which has been retained in Great-Britain ever ſince the pleadings were held in that language, and from that country been transferred to the courts of the United States.

APPELLATIVE, or noun APPELLATIVE in grammar, a common name or a name which is applicable to things of certain kind. Such are the names, man, horſe, plant, tree, &c. *Appellatives* ſtand oppoſed to *proper* names, which belong only to individuals, as, New-York, Waſhington, &c. See GRAMMAR.

APPFLLATIVELY, *adv.* according to the manner of nouns appellative.

APPELLATORY, *adj.* that which contains an appeal.

APPELEE, *n. s.* one who is appealed againſt, and accuſed. But in the civil law the word Appellee properly belongs only to the judge before whom the appeal is brought.

To APPEND, *v. a.* 1. To hang any thing upon another.—2. To add to ſomething as an acceſſary.—2. To add to ſomething, as an acceſſory.

APPEENDAGE, *n. s.* ſomething added to another thing, without being neceſſary to its eſſence, as a portico to the houſe.

APPENDANT, *adj.* 1. Hanging to ſomething elſe.—2. Belonging to; annexed; concomitant.—3. In law, *Appendant* is any thing belonging to another.

APPENDANT, *n. s.* an accidental or adventitious part.

To APPENDICATE, *v. a.* to add to another thing.

APPENDICATION, *n. s.* appendage; annexion.

APPENDIX, *n. s.* 1. Something appended, or added.—2. An adjunct or concomitant. In literature, a treatiſe or ſupplement added at the end of a work, to render it more complete.

To APPERTAIN, *v. n.* 1. To belong to as of right.—2. To belong to by nature or appointment.

APPERTAINMENT, *n. s.* that which belongs to any rank or dignity.

APPERTENANCE, *n. s.* that which belongs or relates to another thing.

APPERTINENT, *adj.* belonging; relating.

APPETENCE, } *n. s.* carnal deſire; ſenſual deſire.
APPETENCY, }

APPETIBILITY, *n. s.* the quality of being deſirable.

APPETIBLE, *adj.* deſirable.

APPETITE, *n. s.* 1. The natural deſire of good.—2. The deſire of ſenſual pleaſure.—3. Violent longing.—4. Keenneſs of ſtomach; hunger; deſire of food.

APPETITE, in medicine, is uſed to denote a natural periodical deſire to eat and drink, in order to repair what had been waſted by the excretions of the body. A loſs of appetite is called anorexia. The gentian root is good in this caſe. See GENTIANA. A prepoſterous appetite for things not proper for food is called *pica*, An immoderate appetite is called *bulimia.* or *fames canina.* Some, however, diſtinguiſh between the *bulimia* and canine appetite; making it the diſtinguiſhing character of the latter, that it is attended with a lientery, or other cœliacal flux.

APPETITION, *n. s.* deſire.

APPETITIVE, *adj.* that which deſires.

To APPLAUD, *v. a.* 1. To praiſe by clapping the hand.—2. To praiſe in general.

APPLAUDER, *n. s.* he who praiſes or commends.

APPLAUSE, *n. s.* approbation loudly expreſſed.

APPLE, *n. s.* 1. The fruit of the apple tree.—2. The pupil of the eye.

APPLE, ADAM'S. See ADAMI POMUM, and CITRUS.

APPLE, BITTER. See COLOCYNTHIS.

APPLE, PINE. See PINUS.

APPLE, TREE, a ſpecies of the genus pyrus. For the deſcription of the genus and of the ſpecies, which pertain to it, ſee the article PYRUS.

APPLIABE, *adj.* more properly written *applicable*, which ſee.

APPLIANCE, *n. s.* the act of applying.

APPLICABILITY, *n. s.* the quality of being fit to be applied to ſomething.

APPLICABLE, *adj.* that which may be applied.

APPLICABLENESS, *n. s.* fitneſs to be applied.

APPLICABLY, *adv.* in ſuch a manner that it may be properly applied.

APPLICATE, *n. s.* a right line drawn acroſs a curve, ſo as to biſect the diamer thereof.

APPLICATION, *n. s.* 1. The act of applying any thing to another.—2. The thing applied.—3. The act of applying to any perſon, as a ſolicitor, or petitioner.—4. The employment of means for a certain end.—5. Intenſeneſs of thought; cloſe ſtudy.—6. Attention to ſome particular affair.

APPLICATION, in geometry, is uſed either for diviſion, for applying one quantity to another, whoſe areas, but not figures, ſhall be the ſame; or, transferring a given line into a circle, or other figure, ſo that its ends ſhall be in the perimeter of the figure.

APPLICATION, in theology, is uſed, by ſome divines, for the act whereby our Saviour transfers to us, what he had earned or purchaſed by his holy life and death. By this application of the merits of Chriſt, we are to be juſtified; and intitled to grace and glory. Application in the concluſion of ſermons, comprehends the improvement to be made by the congregation of what they have heard.

APPLICATIVE, *adj.* that which applies.

APPLICATORY, *adj.* that which comprehends the act of application.

APPLICATORY, *n. s.* that which applies.

To APPLY, *v. a.* 1. To put one thing to another.—2. To lay medicaments upon a wound.—3. To make uſe of as relative or ſuitable.—4. To put to a certain uſe.—5. To uſe as means to an end.—6. To fix the mind upon;

to ſtudy.—7. To have recourſe to, as a ſolicitor or petitioner.—To addreſs to.—9. To endeavour to work on.—10. To act upon; to ply.

To Apply, among mathematicians, ſometimes ſignifies to transfer a line given into a circle, moſt commonly, or into any other figure; ſo that its ends may be in the perimeter of the figure; It is ſynonimous with *divide*, eſpecially among Latin writers.

To APPOINT, *v. a.* 1. To fix any thing.—2. To ſettle any thing by compact, or by decree.—3. To furniſh in all points

APPOINTER, *n. s.* he who ſettles or fixes any thing or place.

APPOINTMENT, *n. s.* 1. Stipulation; the act of fixing ſomething in which two or more are concerned.—2. Decree; eſtabliſhment.—3. Direction; order.—4. Equipment; furniture.—5. An allowance paid to any man, commonly uſed for allowances to public officers.—6. It is alſo often uſed in the ſame ſenſe with aſſignation. By the conſtitution of the United States, the Preſident nominates, and by and with the advice and conſent of the Senate, *appoints*, ambaſſadors, other public miniſters, judges, and all other officers of the United States, whoſe *appointments* are not otherwiſe provided for. But Congreſs may by law, veſt the *appointment* of ſuch inferior officers, as they think proper in the Preſident alone; in the courts of law, or in the heads of departments. See Constitution, U. S. Article II. Sect. 2.

To APPORTION, *v. a.* to ſet out in juſt proportions.

APPOSITE, *adj.* proper; fit; well adapted.

APPOSITELY, *adv.* properly; fitly; ſuitably.

APPOSITENESS, *n. s.* fitneſs; propriety; ſuitableneſs.

APPOSITION, *n.* s. 1. The addition of new matter.—2. In grammar, the putting of two nouns in the ſame caſe.

To APPRAISE, *v. a.* to ſet a price upon any thing, in order to ſale.

APPRAISER, *n. s.* a perſon appointed to ſet a price upon things to be ſold.

To APPREHEND, *v. a.* 1. To lay hold on.—2. To ſeize in order for trial or puniſhment.—3. To conceive by the mind.—4. To think on with terror; to fear.

APPREHENDER, *n. s.* conceiver; thinker.

APPREHENSIBLE, *adj.* that which may be apprehended, or conceived.

APPREHENSION, *n. s.* 1. The mere contemplation of things.—2. Opinion; ſentiments; conceſſion.—3. The faculty by which we conceive new ideas, or power of conceiving them.—4. Fear.—5. Suſpicion of ſomething to happen, or be done.—6. Seizure.—7. Apprehenſion, in logic, differs from *notion*, as the act of the mind, whereby a notion is formed, differs from an act of the mind, whereby we attend to a notion already formed.—8. Apprehenſion is likewiſe uſed to expreſs an inadequate and imperfect idea: and thus it is applied to our knowledge of God, in contradiction to comprehenſion.

APPREHENSIVE, *adj.* 1. Quick to underſtand.—2. Fearful.—3. Perceptive feeling.

APPREHENSIVELY, *adv.* in an apprehenſive manner.

APPREHENSIVENESS, *n. s.* the quality of being apprehenſive.

APPRENTICE, *n. s.* one who is bound by covenant, to ſerve another man, for a certain term of years, upon certain conditions to be performed by the perſon to whom he is bound.

To APPRENTICE, *v. a.* to put out to a maſter as an apprentice.

APPRENTICESHIP, *n. s.* the years which an apprentice is to paſs under a maſter. Seven years ſeem anciently to have been, all over Europe, the uſual term eſtabliſhed for the duration of apprenticeſhips in the greater part of incorporated trades. All ſuch incorporations were anciently called *universities;* which, indeed, is the proper Latin name for any incorporation whatever. The univerſity of ſmiths, the univerſity of taylors, &c. are expreſſions which we commonly meet with in the old charters of ancient towns. When thoſe particular incorporations which are now peculiarly called univerſities, were firſt eſtabliſhed, the term of years which it was neceſſary to ſtudy, in order to obtain the degree of A. M. appears evidently to have been copied from the term of apprenticeſhip in common trades, *of which* the incorporations were much more ancient. *As to have* wrought ſeven years under a maſter properly qualified was neceſſary in order to intitle any perſon to become a maſter, and to have himſelf apprentices in a common trade; ſo to have ſtudied ſeven years under a maſter properly qualified, was neceſſary to intitle him to become a maſter, teacher, or doctor, (words anciently ſynonimous) in the liberal arts, and to have ſcholars and apprentices (words likewiſe originally ſynonimous) to ſtudy under him. The duration of apprenticeſhips in Europe now greatly varies in different places and in different trades, which however it would be of no great utility to particularize. The common rule in the United States is to bind a lad, till he ſhall have completed his 21ſt year, at which time he becomes of age, and there being here no corporation laws to prevent him, he may then commence buſineſs for himſelf.

To APPRETIATE, *v. a.* to ſet a high price, value or eſteem upon any thing.

To APPRIZE, *v. a.* to inform; *to give the knowledge* of any thing.

APPROACH, *n. s.* 1. The act of drawing near.—2. Acceſs.—3. Hoſtile advance.

To Approach, *v. a.* to bring near to.

To Approach, *v. n.* 1. To draw near locally.—2. To draw near, as to time.—3. To make a progreſs towards, in the figurative ſenſe, as mentally.

APPROACHABLE, *adj.* that which may be approached.

APPROACHER, *n. s.* the perſon who approaches or draws near.

APPROACHES, in fortification, the works thrown up by the beſiegers, in order to get nearer a fortreſs without being expoſed to the enemy's cannon. See Fortification.

APPROACHMENT, *n. s.* the act of coming near.

APPROBATION, *n. s.* 1. The act of approving, or expreſſing himſelf pleaſed or ſatisfied.—2. The liking of any thing.—3. Atteſtation; ſupport.

To APPROPERATE, *v. a.* to haſten; to ſet forward.

To APPROPINQUATE, *v. n.* to draw nigh unto; to approach.

APPROPRIABLE, *adj.* that which may be appropriated.

APPROPRIATE, *adj.* peculiar; conſigned to ſome particular uſe or perſon.

To Appropriate, *v. a.* 1. To conſign to ſome particular uſe or perſon.—2. To claim or exerciſe; to take to himſelf by an excluſive right.—3. To make peculiar; to annex.

APPROPRIATION, *n. s.* 1. The application of ſomething to a particular purpoſe.—2. The claim of any thing as peculiar.—3. The fixing a particular ſignification to a word.—4. In the Engliſh law, a ſevering of a benefice eccleſiaſtical to the proper and perpetual uſe of ſome religious houſe, or dean, and chapter, biſhoprick, or college; becauſe, as perſons ordinarily have no right of fee ſimple, theſe, by reaſon of their perpetuity, are accounted owners of the fee ſimple; and therefore are called proprietors.

APPROPRIATOR, *n. s.* he who is poſſeſſed of an appropriated benefice.

APPROVABLE, *adj.* that which merits approbation.

To APPROVE, *v. a.* 1. To like; to be pleaſed with.—2. To expreſs liking.—3. To prove; to ſhow; to juſtify.—4. To experience.—5. To make worthy of approbation.

APPROVEMENT, *n. s.* approbation; liking.

APPROVER, *n. s.* 1. He who approves.—2. He who makes trial.—3. In our common law, one who confeſſing felony of himſelf, accuſeth another, one or more, to be guilty of the ſame: and he is called ſo, becauſe he muſt prove what he hath alledged in his appeal.

APPROXIMATE, *adj.* near to.

APPROXIMATION, *n. s.* Aproach to any thing.—Approximation in arithmetic and algebra, is the coming nearer and nearer to a root, or other quantity ſought, without expecting to be ever able to find it exactly.

APPULSE, *n. s.* the act of ſtriking againſt any thing. Appulſe, in aſtronomy, is the approach of any planet to a conjunction with the ſun, or a ſtar. It is a ſtep towards a tranſit, occultation, conjunction, eclipſe, &c. M. Flamſtead, M. de la Hire, and others, have given obſervations of the moon's appulſes to the Pleiades. *Phil. Trans.* No. 76, p. 361.

APRICOCK, or } *n. s.* a kind of wall fruit, of the pru-
APRICOT, } nus genus. See Prunus.

APRIL, *n. s.* the fourth month of the year, according to the common computation, but the ſecond according to that of the aſtronomers. It contains 30 days. The word is derived from *aperio*, to open; becauſe the earth in this month, begins to open her boſom for the production of vegetables. In this month the ſun travels through the ſign Taurus.

A PRIORI, a kind of demonſtration. See Demonstration.

APRON, *n. s.* a cloth hung before, to keep the other dreſs clean. In gunnery it denotes the piece of lead which covers the touch-hole of a great gun.

APSIS, the arched roof of a houſe, room, or oven, &c. alſo the ring or compaſs of a wheel. It is applied, in aſtronomy, to two points in the orbits of planets, in which they are at the greateſt, and the leaſt diſtance from the ſun or earth. The higher *apsis* is more particularly denominated aphelion, or apogee: the lower perithelion or perigee. See Astronomy.

APT, *adj.* 1. Fit.—2. Having a tendency to; liable to.—3. Inclined to; led to.—4. Ready; quick, as, an *apt wit*.—5. Qualified for.

To Apt, *v. a.* 1. To ſuit; to adapt.—2. To fit; to qualify.

APTERA, a claſſical name, uſed by Linnæus for the 7th order of inſects, comprehending ſuch as have no wings.

APTITUDE, *n. s.* 1. Fitneſs.—2. Tendency.—3. Diſpoſition

APTLY, *adv.* 1. Properly; with juſt connection, or correſpondence; fitly.—2. Juſtly; pertinently.—3. Readily; acutely.

APTNESS, *n. s.* 1. Fitneſs; ſuitableneſs.—2. Diſpoſition to any thing.—3. Quickneſs of apprehenſion; readineſs to learn.

APTOTE, *n. s.* a noun which is not declined with caſes.

APYROUS, a word applied to denote that property of ſome bodies, by which they reſiſt the moſt violent fire without any ſenſible alteration. Apyrous bodies ought to be diſtinguiſhed from thoſe which are *refractory*. Refractory ſubſtances are thoſe which cannot, by violent heat be fuſed, whatever other alteration they may ſuſtain. But a body, properly ſpeaking, apyrous, can neither be fuſed by heat, nor can undergo any other change. Diamonds were long thought to be poſſeſſed of this property. But ſome late experiments have ſhown, that diamonds may be entirely diſſipated or evaporated by heat, and are therefore not entitled to be ranked among apyrous ſubſtances. Perhaps there is no body in nature eſſentially and perfectly apyrous. But it is ſufficient that there be bodies apyrous relatively to the degree of fire which art can produce, to entitle them to that name.

AQUA, *n. s.* a Latin word ſignifying *Water*, very much uſed in the writings of chemiſts, phyſicians, &c. for certain medicines or menſtruums, in a liquid form, diſtinguiſhed from each other by peculiar epithets, as *aqua alexiteria*, *aqua aluminosa*, *aqua mirabilis*, &c.

AQUÆDUCT. See Aqueduct.

Aqua fortis, a name given by artiſts to nitrous acid of a certain ſtrength, from its diſſolving power: that which is concentrated and ſmoking, is called *spirit of nitre*. The aqua fortis uſed by dyers, braſs-founders, &c. is not only weaker than ſpirit of nitre, but contains a portion of vitriolic acid. It may be made by diſtilling crude nitre with calcined vitriol, equal parts. The nitrous acid, expelled by the vitriolic, will riſe in red fume, and paſs into the receiver. The vitriolic acid, uniting with the alkaline baſis of the nitre, forms vitriolated tartar; but, there being more vitrolic acid, than is requiſite to ſaturate the alkali, the ſurplus riſes with the nitrous acid: aquafortis, therefore, is a mixture of theſe two acids. It may alſo be made by diſtilling crude nitre, with ſomewhat more than half its weight of oil of vitriol; or by mixing one part of the vitriol with nine parts pure ſpirit of nitre. See Acid, Nitrous, and Chemistry.

Aqua mercurialis, a preparation of aqua regia, and ſublimate of mercury, with a little mercury, placed in a ſand heat, till the ſolution of the mercury be made. It is a mark of perfection of the aqua mercurialis, if it turn a piece of copper caſt into it, of a ſilver colour. It is by this water that the alchemiſts pretend, all metalline bodies may be reduced to their firſt matter, or mercury.

Aqua mirabilis, the wonderful water, is prepared of cloves, galangals, cubebs, mace, cardomums, nutmegs, ginger, and ſpirit of wine, digeſted 24 hours, then diſtilled.

AQUA REGIA, or AQUA REGALIS, an acid water, ſo called becauſe it diſſolves gold, the king of metals. Its eſſential ingredient, is common ſea ſalt, the only ſalt which will operate on gold. It is prepared by mixing common ſea ſalt, or ſal ammoniac, or the ſpirit of them, with ſpirit of nitre, or common aquafortis. Aqua regia is compoſed of nitrous and marine acid, in different proportions according to the purpoſe for which it is intended. When made with ſal ammoniac, the common proportion is one part of this ſalt or four parts of nitrous acid; but to diſſolve platina, equal parts are requiſite. A purer aqua regia may be made by ſimply mixing the two acids. Aqua regia likewiſe diſſolves all other metals, except ſilver. The gold diſſolved in aqua regia is, in fact, diſſolved in the dephlogiſticated marine acid only, which, being deprived of its phlogiſton by the nitrous acid, recovers it from the gold, and thus renders gold ſoluble; for metals are not ſoluble in acids until they loſe a part of their phlogiſton. See CHEMISTRY.

AQUARIA. See AQUATIA.

AQUARIUS, the WATER-CARRIER, in aſtronomy, the 11th ſign in the zodiac, reckoning from Aries; from which alſo the 11th part of ecliptic takes its name.—The ſun moves through Aquarius in the month of January; it is marked thus, ♒ by aſtronomers. The ſtars in this conſtellation, in Ptolemy's catalogue, are 45; in Tycho's 41; in Hevelius's 47; in Flamſtead's 108. See ASTRONOMY.

AQUATIC, or AQUATICAL. 1. That which inhabits the water.—2. Applied to plants, that which grows in the water.

AQUATILE, *adj.* that which inhabits the water.

AQUATINTA, a method of etching on copper, lately invented, and by which a ſoft and beautiful effect is produced, reſembling a fine drawing in water colours or Indian ink.—Previous to the operation upon the plate, the following powder muſt be prepared. Take equal parts of aſphaltum and fine tranſparent roſin, and powder them ſeparately in a mortar. Sift through a muſlin ſieve, upon a ſheet of paper a thin ſtratum of the aſphaltum, above which ſift a ſimilar layer of the roſin, and upon this another layer of the aſphaltum, continuing theſe alternate layers till both of the powders are exhauſted. Then paſs the mixture both together through the ſame ſieve ſo as to mix them ſufficiently for uſe. Some, inſtead of the above mixture, uſe powdered gum ſandarach only. A copper plate being poliſhed in the uſual way, lay the etching ground upon it, and etch the outlines of the deſign in the manner directed under the article ETCHING. Then ſoften the ground with greaſe, and wipe it off with a rag, leaving as much greaſe upon the plate as juſt to dim the copper. Next ſift the powder upon the ſurface of the plate; after which, ſtrike the other ſide of it pretty ſmartly againſt the edge of a table to diſcharge it of the looſe powder. Then hold the back of the plate with a hand-vice over a chaffing-diſh of burning charcoal, till it become ſo hot as to give pain from being touched with the back of the hand; and the powder which adhered to the greaſe will now be fixed to the plate. The plate being then ſuffered to cool, take turpentine varniſh mixed with ivory black; and with a hair pencil dipt in it, cover all the lights or places where there is no work or ſhade. A border of bees wax is now to be raiſed round the plate; and having diluted a quantity of aquafortis to a proper weakneſs with water, pour it on, and let it ſtand five minutes for the firſt or lighteſt ſhade: after which, pour it off; and having waſhed the plate with water, ſet it edgewiſe to dry. Then with varniſh ſtop out all the light ſhades, pour on the aquafortis for the ſecond tint, and let it ſtand five minutes more; proceeding in the ſame manner for every tint till you produce the darkeſt ſhades. If a bold open ground is wanted in any part, this requires an after operation. The ground muſt be laid as in the other caſe, by ſifting on the powder; only this powder muſt be much coarſer, and the plate more heated, that the particles of the powder may ſpread, and form ſmall circles: good clean roſin will do by itſelf. In etching landſcapes, the ſky and diſtant objects are alſo performed by a ſecond operation, and the powder is ſifted upon the plate with a finer ſieve. If the trees or any part of the fore ground require to be finiſhed higher, the plate muſt be entirely cleanſed from greaſe with bread, and a ground laid in the common way of etching; when the plate may be finiſhed as highly and neatly as poſſible with the *needle* or point, by ſtippling with dots, and biting in thoſe parts, or by a rolling wheel, which is more expeditious. If different colours are to be expreſſed in aquatinta, there will be required ſo many different plates, each having only that part etched upon it which is deſigned to be charged with its proper colour. It may happen, in particular ſubjects, that ſome of the colours are ſo diſtant from each other, as to allow the printer room to rub them in without blending; in which caſe, two or three different colours may be printed from the ſame plate at once. Where different plates are neceſſary, a ſeparate one, having a pin in each corner, muſt be provided as a ſole or bottom to the aquatinta plates; and theſe again muſt be exactly fitted, having each a ſmall hole in their corners for paſſing over the pins of the ſole: the ſaid pins ſerving the double purpoſe of retaining the plates ſucceſſively in their due poſition, and of directing the printer in placing the paper exactly on each plate ſo as not to ſhift; by which means each tint or colour will be *exactly* received on its proper place. This is the method *practiſed in France.* A landſcape or any ſimilar ſubject may be printed off at once in its different proper colours, by laying theſe upon the plate. In this caſe, the colours muſt be pretty thick in their conſiſtence; and the plate muſt be carefully wiped in the uſual way after laying on each tint, as well as receive a general wipe when charged with all the tints. The art of engraving in aquatinta is kept a ſecret by thoſe artiſts who practiſe it. In order to ſucceed in it, great care and judgment are requiſite; and much depends upon a certain nicety of management, which is only attainable by practice.

AQUA-VITÆ. It is commonly underſtood of what is otherwiſe called brandy, or ſpirit of wine, either ſimple or prepared with aromatics. But ſome appropriate the term brandy to what is procured from wine, or the grape; *aqua-vitæ*, to that drawn after the ſame manner from malt. See the articles BRANDY and DISTILLATION.

AQUEDUCT, *n. s.* in hydraulics and architecture, a ſtructure formed for conveying water from one place to another, over grounds that are unequal. The word is compounded of the Latin ſubſtantives *aqua*, water, and *ductus*, a channel, by which the water may be conducted. Aqueducts of every kind were long ago the wonders of Rome; the vaſt quantity of them which they had; the prodigious expence employed in conducting water over arcades from one place to another, at the diſtance of 30, 40, 60, and even 100 miles, which were either continued or ſupplied by other labours, as by cutting mountains and piercing rocks; all this may well ſurpriſe us; nothing like it is undertaken in our times: we dare not purchaſe conveniency at ſo dear a rate. Appius Claudius the cenſor adviſed and conſtructed the firſt aqueduct. His example gave the public luxury a hint to cultivate theſe objects; and the force of prodigious and indefatigable labour diverted the courſe of rivers and floods to Rome. Agrippa, in that year when he was ædile, put the laſt hand to the magnificence of theſe works. It is chiefly in this reſpect that the modern ſo much reſembles the ancient city of Rome. For this advantage, ſhe is peculiarly indebted to Sextus V. and to Paul V. who for grandeur and magnificence emulated the maſters of the univerſe. There are ſtill to be ſeen, in different places contiguous to Rome, ſtriking remains of theſe aqueducts; arches continued through a long ſpace, over which were extended the canals which carried the water to the city. The aqueduct which Lewis XIV. cauſed to be built near Maintenon, for carrying water from the river Bucq to Verſailles, is perhaps the greateſt aqueduct now in the world; being 7000 fathoms in length, above 2560 in height, and containing no fewer than 242 arcades.

AQUEOUS, *adj.* watery.

AQEOUS HUMOUR. See ANATOMY, Part. VII. Sect. 6.

AQUIDNECK, the Indian name of Rhode-Iſland.

AQUILA, in aſtronomy, the EAGLE, a conſtellation of the northern hemiſphere; uſually joined with Antinous. The ſtars in the conſtellation Aquila and Antinous, in Ptolemy's catalogue, are 15; in Tycho's 19; in Hevelius's 42; in the Britannic catalogue, 71. See ASTRONOMY.

AQUILA, in ornithology, a ſynonime of the eagle. See FALCO.

AQUILEGIA, COLUMBINE: A genus of the pentagynia order, belonging to the polyandria claſs of plants; and, in the natural method, ranking under the 16th order, Multiſiliquæ. It has no calyx; the petals are five, with a hornlike nectarium inſerted between each; and there are five ſeparate capſules. There are four ſpecies, viz. The Alpina, the Canadenſis, or Canadian columbine, the Inverſa, or garden columbine, and the Vulgaris, or common columbine. The columbine has been looked upon as aperient; and was formerly in great eſteem among the common people for throwing out the ſmall-pox and meaſles. A diſtilled water, medicated vinegar, and conſerve, was prepared from the flowers; but they have long given place to medicines of greater efficacy.

AQUILINE, *adj.* reſembling an eagle; when applied to the noſe, hooked.

ARABIA, including all the countries diſtinguiſhed by that name, is of very great extent, the moſt ſoutherly part lying in 12. 30. and the moſt northerly in 30. N. Lat. and from E. to W. it extends in the broadeſt part from 110. to 135. E. Long. from Philadelphia. Hence it is computed to be 1300 miles in length, & 1200 in breadth, where it is broadeſt; but in the moſt northern part it is very narrow. This extenſive country is a peninſula, bounded on the N. E. by the river Euphrates and the Perſian gulf; on the S. by the Indian and Æthiopic ocean; on the W. by the Red Sea, the iſthmus of Suez, and part of Syria; and on the N. W. by Syria and Dierbec, or Meſopotamia. Arabia is divided into three grand diviſions; Arabia Felix, or "Arabia the Happy," which is the moſt ſouthern, and the much largeſt part; Arabia Deſerta, or "Arabia the Deſert," which is ſituated in the middle; and Arabia Petræa, which lies to the north. In this country there are but few ſprings, and no conſiderable rivers, except the Euphrates, which waſhes its north-eaſt limits. As the tropic of Cancer extends through the middle of it, the air is exceſſively hot, and in many places unhealthful, particularly in that part which lies upon the coaſt. The winds are alſo hot and ſuffocating, and the ſands not only extremely troubleſome, but dangerous, they being ſometimes driven by the winds in ſuch prodigious clouds, that whole caravans have been buried and loſt by a ſingle ſtorm. An officer in the ſervice of the Engliſh Eaſt-India Company, deſcribes a hot wind which frequently happens in Arabia, and is called Samiel. It blows in the months of July and Auguſt, from the N. W. quarter, and ſometimes extends, in all its violence, to the very walls of Bagdad, but never effects any within the walls. Some years it does not blow at all, and ſometimes it appears ſix, eight, or ten times in the courſe of a year, but ſeldom continues longer than a few minutes at a time. It often paſſes with the apparent quickneſs of lightning. The Arabians and Perſians are warned of its approach by a thick haze, which appears like a cloud of duſt at the extremity of the horizon; immediately upon ſight of which, they throw themſelves with their faces to the ground, and continue thus proſtrate till the wind is paſſed, which frequently happens to be almoſt inſtantaneous; but ſhould they be ſo unfortunate as not be be ſufficiently attentive or alert to effect this, and, in conſequence, become expoſed to its full force, the conſequence is inſtant death. That part of the country diſtinguiſhed by the name of "The Happy," to a ſtranger traverſing its ſhores, would appear to have little claim to that title; but place him in the middle regions, beneath her balm-dropping woods, and amidſt her verdant vales, where the fruits of every climate court his taſte, and the breezes of Caſſia refreſh his ſenſes, and he will be convinced that the ancients very juſtly diſtinguiſhed this country by that emphatical appellation. This country is moſt famous for its coffee and its dates, which laſt are found ſcarce any where in ſuch perfection as here and in Perſia. With coffee, a number of ſhips are annually loaded for Europe and India. Arabia alſo abounds in balm, frankincenſe, myrrh, manna, caſſia, incenſe, and other valuable drugs; but they have very few trees fit for timber, and little wood of any kind in the country. The moſt uſeful and excellent animals of Arabia are their camels and horſes; their camels are extremely proper for this ſandy country: their breed of horſes are only fit for the ſaddle, and are never uſed for draught or burden. The fineſt horſes in the Perſian court are brought from hence, and are admired for their form, as much as for their ſwiftneſs and high mettle; they are indeed well known in Europe, and have contributed to improve the breed of thoſe in England. Lions, tigers, wolves, jackalls, and other wild beaſts are alſo found in ſome parts of Arabia. Arabia Deſerta has its name from the nature of its ſoil, which is barren ſand. "In the dreary waſte of Arabia," ſays Mr. Gibbon, "a boundleſs level of ſand is intercepted by ſharp and naked mountains, and the face of the deſert, without ſhade or ſhelter, is ſcorched by the direct and intenſe rays of a tropical ſun." There are, however, large flocks of ſheep and herds of cattle near the Euphrates, where the land is good; there are alſo a great number of oſtriches in the deſert, and in ſeveral places a fine breed of camels. This country in general differs but little from Arabia Petræa, which is ſituated to the north of it, and is by far the ſmalleſt of the three diviſions of Arabia. Arabia Petræa has its name from Petræa, its ancient capital, now deſtroyed, and is famous for the children of Iſrael wandering there during forty years. “ People are not there," ſays the reverend Dr. Shaw, “ entertained with a view of paſtures covered with flocks, or vallies enriched with corn. There are no oliveyards or vineyards; but the whole is a deſolate, loneſome wilderneſs, only diverſified by ſandy plains and mountains of naked rocks and craggy precipices." As in thoſe dreary deſerts, people have no proſpects of meeting with the leaſt hoſpitality, they are obliged to carry along with them every thing neceſſary for ſo tedious a journey: travellers therefore uſually provide a ſufficient number of goat's ſkins, which they fill with water as often as they find it. They provide balls made of the flower of beans or of barley for their camels; and wheat, flour, biſcuit, potted fleſh, honey, and ſuch other things as will keep, for themſelves. They take with them alſo wooden diſhes, and a copper pot, for their kitchen furniture. When they are obliged to boil or bake, they make uſe of camels dung, left by ſome preceding caravan, which, after having been expoſed a day or two in the ſun, catches fire like touch-wood, and burns as bright as charcoal. No ſooner is the food prepared, than one of the Arabs, placing himſelf on the higheſt ſtation he can find, calls out three times with a loud voice, to invite all his brethren, the ſons of the faithful, to come and partake of it, though none of them are perhaps within one hundred miles of him. This cuſtom the Arabs conſtantly maintain as a token of their benevolence. What is called “ The Deſert of Sinai," is a beautiful plain, near nine miles long, and above three in breadth; it lies open to the north-eaſt, but to the ſouthward is cloſed by ſome of the lower eminences of Mount Sinai; and other parts of that mountain make ſuch encroachments upon the plain, as to divide it in two; each ſo capacious as to be ſufficient to receive the whole camp of the Iſraelites. That which lies to the eaſtward of the mount is perhaps the deſert of Sinai, properly ſo called, where Moſes ſaw the angel of the Lord in a burning buſh. Over the place, where is ſaid to be this divine appearance, is erected the convent of St. Catharine, which belongs to the Greeks, and is three hundred feet ſquare, and above forty in height. On the ſpot where they ſuppoſe the burning buſh ſtood, is a little chapel, where the monks, in imitation of Moſes, put off their ſhoes whenever they enter it. This, with ſome other chapels dedicated to particular ſaints, is included within the church of the *Transfiguration*, a large beautiful ſtructure, ſupported by two rows of marble columns, and the floor elegantly adorned with a variety of devices in Moſaic work; as are alſo the floor and walls of the preſbyterium. There is here a tower built by the empreſs Helena: it is ſituated in the centre of the convent, where the archbiſhop's lodgings now are; it has three chapels, and is ſtill called St. Helen's tower. The door of this convent is never opened but when the archbiſhop, who generally reſides at Cairo, comes thither to be inſtalled. Pilgrims are admitted by being drawn up near thirty feet high by a windlaſs, and then taken in at a window, where ſome of the lay brothers attend for that purpoſe. Theſe, with all the preſbyters, who are commonly called kalores, amount to about one hundred and fifty, and chiefly ſubſiſt upon the proviſion ſent them monthly from Cairo. They live a very auſtere life, abſtaining not only from fleſh, but from butter, milk, and eggs. Though no kind of ſoil is found in this part of Arabia, theſe monks have, in a long proceſs of time, covered with dung and the ſweeping of their convent four acres of theſe naked rocks, which now produce as good roots, cabbage, ſallads, and all ſorts of pot-herbs, as any climate or ſoil whatſoever. They have alſo raiſed a great number of apple, pear, plum, almond, and olive-trees, of excellent kinds. This little garden is an evident proof of the great advantages that may be procured by indefatigable induſtry. The ſummit of this mountain appears ſomewhat conical, and is not very ſpacious: the Mahometans, as well as the Chriſtians, have a chapel there for public worſhip. Travellers are there ſhewn the place where Moſes received the law, where he hid himſelf from the face of God, and where his hand was ſupported by Aaron and Hur at the battle with Amalek; with ſeveral other places mentioned in the Holy Scriptures, and with which they ſeem as well acquainted as if they had been preſent when theſe great events were tranſacted. The Arabians are of a middle ſtature, thin and of a ſwarthy complexion; with black eyes and hair. Their voices are rather effeminate than ſtrong; yet they are a brave people, very expert at the bow and lance, and, ſince they have been acquainted with fire-arms, are become pretty good markſmen. The roving Arabs wear a kind of blue ſhirt faſtened about them with a white ſaſh, and ſome of them have over it a fur ſheep-ſkin veſt. They have a cap or turban on their heads; ſometimes they wear ſlippers, but never any ſtockings. Many of them go almoſt naked, but the women are generally ſo wrapped up, that nothing can be diſcovered but their eyes. Both ſexes appear to be ſo very healthy as to be almoſt ſtrangers to diſeaſes. The people of the eaſt eſteem the Arabian tongue the richeſt and moſt copious of any in the world. It is every where conſidered by the orientals as a learned language; and even in Perſia and India, the koran is never read in any other tongue. But although the Arabs have in former ages been famous for their learning and ſkill in all the liberal arts, yet, at preſent, there is ſcarce any country where the people are ſo univerſally ignorant as in Arabia; and though they are generally conſidered as only bands of robbers, yet in thoſe places where they are ſettled, and apply to the cultivation of the earth, to trade, and mechanic arts, they are diſtinguiſhed by their juſtice, temperance, and humanity. The Arabs who live in towns are very inconſiderable in point of number, compared with thoſe who live in tents, and are called Bedouins. Theſe people have no fixed habitation; but being poſſeſſed of large flocks of ſheep, herds of camels and goats, rove from one part of the country to another, where they can find paſture and water for their cattle; and when they have deſtroyed all the forage, load their goods and baggage, with their wives and children, on their camels, and march on in ſearch of freſh paſturage. The Arabs are excellent horſemen, and harraſs an enemy by their ſudden attack, and, like the ancient Parthians, even defeat them when purſued. They are not very fond of fighting upon equal terms with the ſcymeter, but truſt much more to the fleetneſs of their horſes, and their ſkill in throwing the lance, firing, and diſcharging their arrows at thoſe who purſue them. Their religion is Mahometaniſm. For an account of which, ſee ALCORAN and MAHOMET.

ARACAN, or RECCAN, the capital of a ſmall kingdom, N. E. of the bay of Bengal. It has the conveniency of a ſpacious river, and a harbour large enough to hold all the ſhips in Europe. It is ſaid by Schouten to be as large as Amſterdam; but the houſes are in general ſlight, being made with palm trees and bamboo canes, and covered with leaves of trees. Some of the ſtreets are on the ridges of rocks, wherein are a great many ſhops. Their orchards and gardens contain all the fruit common to the Indies, and their trees are green all the year. Elephants and buffaloes are very numerous here, and are made uſe of inſtead of horſes. They have plenty of proviſions, but little trade. There religion is Paganiſm; and the idols, temples, and prieſts are very numerous. The rich burn their dead bodies; but the poor, who are not able to buy wood, throw them into the river. Long. 168. 16. E. Lat. 20. 6. N.

ARACARI, in ornithology, the name of a Braſilian bird of the woodpecker kind. It is of the ſize of our common green woodpecker, and has a very large, ſharp, and ſomewhat hooked beak. See PICUS. See Plate IX. Fig. 10.

ARACHNOIDES, in anatomy, a fine, thin, tranſparent membrane, which lying between the dura and pia mater, is ſuppoſed to inveſt the whole ſubſtance of the brain. Plate X. Fig. 4.

ARACK, ARRACK, or RACK, a ſpirituous liquor imported from the Eaſt Indies, uſed by way of dram and in punch. The word arrack is an Indian name for ſtrong waters of all kinds; but what we underſtand by this word, is no other than a ſpirit produced by diſtillation from a vegetable juice called *toddy*, which flows by inciſions from the cocoa-nut tree, like the maple juice procured among us. The manner of making arack at Goa is this: The juice of the trees is not procured in the way of tapping, as we do; but the operator provides himſelf with a parcel of earthen pots, with bellies and necks like our ordinary bird bottles; he makes faſt a number of theſe to his girdle, and any way elſe that he commodiouſly can about him. Thus equipped, he climbs up the trunk of a cocoa tree; and when he comes to the boughs, he takes out his knife, and cutting off one of the knots or buttons, he applies the mouth of the bottle to the wound, faſtening it to the bough with a bandage; in the ſame manner he cuts off other buttons, and faſtens on his pots, till the whole number is uſed: this done in the evening, and deſcending from the tree, he leaves them till the next morning; when he takes off the bottles, which are moſtly filled, and empties the juice into the proper receptacle. This is repeated every night, till a ſufficient quantity is produced; and the whole being then put together, is left to ferment, which it ſoon does. When the fermentation is over, and the liquor or waſh is become a little tart, it is put into the ſtill, and a fire being made, the ſtill is ſuffered to work as long as that which comes over has any conſiderable taſte of ſpirit. The liquor thus procured is the low wine of arack; and this is ſo poor a liquor, that it will ſoon corrupt and ſpoil, if not diſtilled again, to ſeparate ſome of its phlegm; they therefore immediately after pour back this low wine into the ſtill, and rectify it to that very weak kind of proof-ſpirit, in which ſtate we find it. There is a paper of obſervations on arack, in the *Melanges d'Hiſtoire Natur. tome* v. p. 302. By fermenting, diſtilling, and rectifying the juice of the American maple, which has much the ſame taſte as that of the cocoa, the author ſays, he made arack not in the leaſt inferior to any that comes from the the Eaſt Indies; and he thinks the juice of the ſycamore and of the birch trees would equally anſwer the end.

ARÆOMETER, an inſtrument wherewith to meaſure the denſity or gravity of fluids. The aræometer, or water-poiſe, is uſually made of glaſs; conſiſting of a round hollow ball, which terminates in a long ſlender neck hermetically ſealed at top; there being firſt as much running mercury put into it as will ſerve to balance or keep it ſwimming in an erect poſition. The ſtem is divided into degrees, as repreſented Plate XII. fig. 23; and by the depth of its deſcent into any liquor, the lightneſs of that liquor is is concluded: for that fluid in which it ſinks leaſt muſt be heavieſt; and that in which it ſinks loweſt, lighteſt. M. Homberg has invented a new aræometer, deſcribed in *Phil. Tranſact.* No. 262, thus: *A* is a glaſs bottle or matraſs, with ſo ſlender a neck that a drop of water takes up in it about five or ſix lines, or half of an inch. Near that neck is a ſmall capillary tube *D*, about ſix inches long, and parallel to the neck.—To fill the veſſel, the liquor is poured in at the mouth *B*, (which is widened to receive a tunnel,) till it run out at *D*, that is, till it riſe in the neck to the mark *C*, by which means you have always the ſame bulk or quantity of liquor; and conſequently, by means of the balance, can eaſily tell, when different liquors fill it, which weighs moſt, or is moſt intenſely heavy. Some regard, however, is to be had in theſe trials to the ſeaſon of the year and degree of heat and cold in the weather; becauſe ſome liquors rarefy with heat and condenſe with cold more than others, and accordingly more or leſs room. See HYDROMETER.

ARALIA, in botany, the ANGELICA TREE: A genus of the pentagynia order, belonging to the pentandria claſs of plants; and in the natural method, ranking under the 46th order, Hederaceæ. The eſſential characters are: The involucrum is an umbella; the calix is quinquedentated, and above the fruit; the corolla conſiſts of five petals; and the berry has five ſeeds. There are five ſpecies of aralia, all natives of America. The principal are,

1. The NUDICAULIS, which grows three or four feet high; the leaves have two large trifoliated lobes, which are ſawed on their edges. The flower ſtalks, ariſe between theſe, immediately from the root, and are terminated by round umbels of ſmall four leaved flowers, of a whitiſh colour.

2. The SPINOSA, with a prickly ſtem, which is a very ornamental ſhrub, and a native of Virginia. The height to which this tree will grow, if the ſoil and ſituation wholly agree with it, is about 12 feet; and the ſtem, which is of a dark brown colour, is defended by ſharp ſpines, which fall off; even the leaves, which are branching, compoſed of many wings, and of a pleaſant green colour, have theſe defenders; which are crooked and ſtrong, and ſtand as guards to them till the leaves fall off in the autumn. The flowers are produced in

large umbels from the ends of the branches: They are of a greeniſh yellow colour; and their general characters indicate their ſtructure.

ARANEA, in entomology, the SPIDER; a genus of inſects belonging to the order of aptera, or inſects without wings. All the ſpecies of ſpiders have eight legs, with three joints in each, and terminating in three crooked claws; eight eyes, two before, two behind, and the reſt on the ſides of the head. In the fore part of the head, at the mouth, there is a pair of ſharp crooked claws or forceps: theſe ſtand horizontally; and, when not exerted for uſe, are concealed in two caſes contrived for their reception, in which they fold like a claſp-knife, and there lie between two rows of teeth. Theſe claws are the weapons with which they kill flies, &c. for their food. The belly or hinder part is ſeparated from the head and breaſt by a ſmall thread-like tube. The ſkin or outer ſurface is a hard poliſhed cruſt. Spiders have five tubercles and nipples at the extremity of the belly, whoſe apertures they can enlarge or contract at pleaſure. It is through theſe apertures that they ſpin a gluey ſubſtance of which their bellies are full. They fix the end of their threads by applying theſe nipples to any ſubſtance, and the thread lengthens in proportion as the animal recedes from it. They can ſtop the iſſuing of the threads by contracting the nipples, and reaſcend by means of the claws on their feet, much in the ſame manner as ſome men warp up a rope. When the common houſe ſpider begins her web, ſhe generally chooſes a place where there is a cavity, ſuch as the corner of a room, that ſhe may have a free paſſage on each ſide, to make her eſcape in caſe of danger. Then ſhe fixes one end of her thread to the wall, and paſſes on to the other ſide, dragging the thread along with her (or rather the thread follows her as ſhe proceeds,) till ſhe arrives at the other ſide, and there fixes the other end of it. Thus ſhe paſſes and repaſſes, till ſhe has made as many parallel threads as ſhe thinks neceſſary for her purpoſe. After this, ſhe begins again and croſſes theſe by other parallel threads, which may be named the *woof*. Theſe are the toils or ſnares which ſhe prepares for entangling flies, and other ſmall inſects, which happen to light upon it. She alſo generally weaves a ſmall cell for herſelf, where ſhe lies concealed watching her prey. Betwixt this cell and the large web ſhe has a bridge of threads, which, by communicating with the threads of the large one, both give her early intelligence when any thing touches the web, and enables her to paſs quickly in order to lay hold of it. There are many other methods of weaving peculiar to different ſpecies of ſpiders; but as they are all intended for the ſame purpoſe, it is needleſs to give particular deſcriptions of them. The matter of which the ſpider's threads are formed, is a viſcid juice, elaborated in the body of the animal, and emitted from papillæ ſituated at the extremity of the belly; which are furniſhed with numerous apertures that do the buſineſs of wire-drawers, as it were, in forming the threads. Of theſe apertures Mr. Reaumur obſerves, there are enough in the compaſs of the ſmalleſt pin's head to yield a prodigious quantity of diſtinct threads. The holes are perceived by their effects: take a large garden ſpider ready to lay its eggs, and applying the finger on a part of its papillæ, as you withdraw that finger it will take with it an amazing number of different threads. Mr. Reaumur has often counted 70 or 80 with a microſcope, but has perceived that there were infinitely more than he could tell. In effect, if he ſhould ſay that each tip of a papilla furniſhed a thouſand, he is perſuaded he would ſay far too little. The part is divided into an infinity of little prominences, like the eyes of a butterfly, &c. Each prominence no doubt makes its ſeveral threads; or rather between the ſeveral protuberances there are holes that give vent to threads; the uſe of the protuberances, in all probability, being to keep the threads at their firſt exit, before they are yet hardened by the air, aſunder. In ſome ſpiders thoſe protuberances are not ſo ſenſible; but in lieu thereof there are tufts of hair which may ſerve the ſame office, viz. to keep the threads a-part. Be this as it will, there may threads come out at above a thouſand different places in every papilla; conſequently the ſpider, having five papillæ, has holes for above five thouſand threads. Such is the tenuity of the threads in the larger ſort of ſpiders. But if we examine the young produced by thoſe, we ſhall find that they no ſooner quit their egg than they begin to ſpin. Indeed their threads can ſcarce be perceived, but the webs may: they are frequently as thick and cloſe as thoſe of houſe ſpiders; and no wonder, there being often 400 or 500 little ſpiders concurring to the ſame work. How minute muſt their holes be? the imagination can ſcarce conceive that of their papillæ! The whole ſpider is perhaps leſs than a papilla of the parent which produced it. But there are even ſome kinds of ſpiders ſo ſmall at their birth, that they are not viſible without a microſcope. There are uſually found an infinity of theſe in a cluſter, and they only appear like a number of red points: And yet there are webs found under them, though well nigh imperceptible. What muſt be the tenuity of one of theſe treads? Mr. Lewenhoek has computed that 100 of the ſingle threads of a full grown ſpider are not equal to the diameter of the hair of his beard; and conſequently, if the threads and hair be both round, 10,000 ſuch threads are not bigger than ſuch a hair. He calculates further, that when young ſpiders firſt begin to ſpin, 400 of them are not larger than one of a full growth; allowing which, 4,000,000 of a young *ſpider's threads are* not ſo big as the ſingle hair of a man's beard. The ſpecies of aranea enumerated by naturaliſts amount to upwards of 50; of which it may here ſuffice to mention a few of the moſt remarkable.

1. The AQUATICA, or the WATER-SPIDER, is of a livid colour, with an oval belly, and a tranſverſe line, and two hollowed points. It frequents the freſh waters: but it is in ſome ſort amphibious; for it can live on land as well as in the water, and comes often on ſhore for its food; yet it ſwims well in the water both on its belly and back: it is diſtinguiſhable by its brightneſs. In the water its belly appears covered with a ſilver varniſh, which is only a bubble of air attached to the abdomen by means of oily humours which tranſpire from its body, and prevent the immediate contact of the water. This bubble of air is made the ſubſtance of its dwelling, which it conſtructs under water: for it fixes ſeveral threads of ſilk, or ſuch fine matter, to the ſtalks of plants in the water; and then aſcending to the ſurface, thruſts the hinder part of its body above water, drawing it back again with ſuch rapidity, that it attaches underneath a bubble of air, which it has the art of detaining under water, by placing it underneath the threads above

mentioned, and which it binds like a covering almoſt all around the air bubble. Then it aſcends again for another air bubble; and thus proceeds until it has conſtructed a large aerial apartment under water, which it enters into or quits at pleaſure. The male conſtructs for himſelf one near to the female; and when love invites, he breaks through the thread walls of the female's dwelling, and the two bubbles attached to the bellies of both unite into one, forming one large nuptial chamber. The female takes care of the young, and conſtructs ſimilar apartments on purpoſe for them. The figure of this ſpider has nothing remarkable; and would be overlooked among a crowd of curioſities, if the ſpectator be unacquainted with its ſingular art of conſtructing an aerial habitation under water, and thus uniting together the properties of both elements. It lodges during the winter in empty ſhells, which it dextrouſly ſhuts up with a web.

2. The **Avicularia** has a convex round breaſt, hollowed tranſverſely in the middle. It is a native of South America, and feeds upon ſmall birds, inſects, &c. The bite of this ſpider is as venomous as that of the ſerpent.

3. The **Diadema**, which has its abdomen of an oval form, downy, and of a ruddy yellow colour, which is very variable in different ſeaſons; being ſometimes pale, at others very dark coloured. The upper part is beautifully adorned with black and white circles and dots, having a longitudinal band in the middle, compoſed of oblong or oval ſhaped pearl coloured ſpots, ſo arranged as to reſemble a fillet, ſimilar to thoſe worn by the eaſtern kings. The ground upon which this fillet and the white dots are laid, when viewed with a glaſs, and the ſun ſhining thereon, is beautiful and rich beyond all deſcription; but there are varieties in colour of this ſpider. It inhabits the birch tree.

4. The **Fasciata**, with yellow bands round the belly, and duſky rings on the legs, is a native of Barbary, and is as large as the thumb. It inhabits hedges and thickets; its webs have large meſhes, and it reſides in the centre. The ſnares are ſpread for large flies, waſps, drones, and even locuſts: the leſſer inſects can eſcape through the meſhes. The animal which it entangles is ſoon bound with ſtrong threads; killed by the ſpider's jaws, and partly eat, if the ſpider is hungry; the reſt is concealed under ſome neighbouring dry leaves, covered with a kind of web and a blackiſh glue in great abundance. Its larder is ſaid to be often plentifully ſtored. Its neſt is of the ſize of of a pigeon's egg, divided horizontally, and ſuſpended by the threads of the inſect, which are of a ſilvery white, and ſtronger than ſilk. The young ones live in amity; but when grown up, are mortal enemies. They never meet but they fight with violence, and their battle only ends with the death of the weakeſt. The dead body is carefully ſtored in the larder. Twelve of theſe ſpiders, by way of experiment, were ſhut up together; and, after a battle of eight days, the ſtrongeſt only remained alive.

5. The **Tarantula** has the breaſt and belly of an aſh colour; the legs are alſo aſh coloured, with blackiſh rings on the under part; the fangs or nippers are red on the inner ſide, the reſt being blackiſh: Two of its eyes are larger than the other, red, and placed in the front; four other eyes are placed in a tranſverſe direction towards the mouth; the other two are nearer the back: It has two antennæ or feelers. It is a native of Italy, Cyprus, Barbary, and the Eaſt Indies. It lives in bare fields, where the lands are fallow, but not very hard; and from its antipathy to damp and ſhade, chooſes for its reſidence the riſing part of the ground facing the eaſt. Its dwelling is about four inches deep, and half an inch wide; at the bottom it is curved, and there the inſect ſits in wet weather, and cuts its way out, if water gains upon it. It weaves a net at the mouth of the hole. Theſe ſpiders do not live quite a year. In July they ſhed their ſkin, and proceed to propagation; which, from a mutual diſtruſt, as they frequently devour one another, is a work undertaken with great circumſpection. They lay about 730 eggs, which are hatched in the ſpring; but the parent does not live to ſee her progeny, as ſhe expires early in the winter. The Ichneumon fly is their moſt formidable enemy. The bite of the tarantula is ſaid to occaſion an inflammation in the part, which in a few hours brings on ſickneſs, difficulty of breathing, and univerſal faintneſs, The perſon is afterwards affected with a delirium, and ſometimes is ſeized with a deep melancholy. The ſame ſymptoms return annually, in ſome caſes, for ſeveral years; and at laſt terminate in death. Muſic, it has been pretended, is the only cure. A muſician is bro't, who tries a variety of airs, till at laſt he hits upon one that urges him to dance; the violence of which exerciſe produces a proportionable agitation of the vital ſpirits, attended with a conſequent degree of perſpiration, the certain conſequence of which is a cure. Such are the circumſtances which have generally been related, and long credited, concerning the bite of this animal. In the Philoſophical Tranſactions for 1672, p. 406, is an extract of a letter from Dr. Thomas Cornelio, a Neapolitan phyſician, to John Doddington, Eſq. his Britannic majeſty's reſident at Venice, in which, ſpeaking of his intention to ſend to Mr. Doddington ſome tarantulas, he ſays, "Mean while I ſhall not omit to impart to you what was related to me a few days ſince by a judicious and unprejudiced perſon; which is, that being in the country of Otranto, where thoſe inſects are in great numbers, there was a man, who thinking himſelf ſtung by a tarantula, ſhowed in his neck a ſmall ſpeck, about which in a very ſhort time, there aroſe ſome pimples full of a ſerous humour; and that, in a few hours after, the poor man was ſorely afflicted with very violent ſymptoms, as ſyncopes, very great agitations, giddineſs of the head, and vomiting; but that, without any inclination at all to dance, and without any deſire of having any muſical inſtruments, he miſerably died within two days. The ſame perſon affirmed to me, that thoſe who think themſelves bitten by tarantulas, are for the moſt part young wanton girls, whom the Italian writers call *Dolce di Sale;* who, by ſome particular indiſpoſition, falling into this melancholy madneſs, perſuade themſelves, according to the vulgar prejudice, to have been ſtung by a tarantula." Dr. Serao, an Italian phyſician, has written an ingenious book, in which he has effectually exploded this opinion as a popular error; and in the Philoſophical Tranſactions, N° LX. for the year 1770, p. 236. in a letter from Dominico Cirillo, profeſſor of natural hiſtory, in the univerſity of Naples, wherein, taking notice of Serao's book, he ſays, "That having had an opportunity of examining the effects of this animal in the province of Taranto, where it is found in great abundance,

he finds that the ſurpriſing cure of the bite of the Tarantula by muſic, has not the leaſt truth in it; and that it is only an invention of the people, who want to get a little money by dancing when they ſay the tarantiſm begins."—He adds, "I make no doubt but ſometimes the heat of the climate contributes very much to warm their imaginations, and throw them into a delirium, which may in ſome meaſure be cured by muſic; but ſeveral experiments have been tried with the tarantula, and neither men nor animals after the bite have had any other complaint than a very trifling inflammation upon the part, like that produced by the bite of a ſcorpion, which goes off by itſelf without any danger at all. In Sicily, where the ſummers are ſtill warmer than in any part of the kingdom of Naples, the tarantula is never dangerous; and muſic is never employed for the cure of the pretended tarantiſm.' Mr. Swinburn, when in the country of the tarantula, was deſirous of inveſtigating minutely every particular relative to that inſect; but the ſeaſon was not far enough advanced, and no *tarantati* (perſons bitten, or pretending to be bitten, by the tarantula) had begun to ſtir. He prevailed, however, upon a woman who had formerly been bitten, to act the part, and dance the tarantata before him. A great many muſicians were ſummoned, and ſhe performed the dance, as all preſent aſſured him, to perfection. At firſt ſhe lolled ſtupidly on a chair, while the inſtruments were playing ſome dull muſic. They touched, at length, the chord ſuppoſed to vibrate to her heart; and ſhe ſprung up with a moſt hideous yell, ſtaggered about the room like a drunken perſon, holding a handkerchief in both hands, raiſing them alternately, and moving in very true time. As the muſic grew briſker, her motions quickened, and ſhe ſkipped about with great vigour and variety of ſteps, every now and then ſhrieking very loud. The ſcene was far from pleaſant; and, at his deſire, an end was put to it before the woman was tired. Wherever the tarantati are to dance, he informs us, a place is prepared for them, hung round with bunches of grapes and ribbons. The patients are dreſſed in white, with red, green, or yellow ribbons, for thoſe are their favourite colours; on their ſhoulders they caſt a white ſcarf, let their hair fall looſe about their ears, and throw their heads as far back as they can bear it. They are exact copies of the ancient prieſteſſes of Bacchus. The orgies of that god, whoſe worſhip, under various ſymbols, was more widely ſpread over the globe than that of any other divinity, were no doubt performed with energy and enthuſiaſm by the lively inhabitants of this warm climate. The introduction of Chriſtianity aboliſhed all public exhibitions of theſe heatheniſh rites, and the women durſt no longer act a frantic part in the character of Bacchantes. Unwilling to give up ſo darling an amuſement, they deviſed other pretences; and poſſeſſion by evil ſpirits may have furniſhed them with one.—Accident may alſo have led them to the diſcovery of the tarantula; and, upon the ſtrength of its poiſon, the Puglian dames ſtill enjoy their old dance, though time has effaced the memory of its ancient name and inſtitution; and this Mr. Swinburn takes to be the origin of ſo ſtrange a practice. If at any time theſe dancers are really and involuntarily affected, he ſuppoſes it can be nothing more than an attack upon their nerves, a ſpecies of St. Vitus's dance; and he inclines the more to the idea, as there are numberleſs churches and places throughout theſe provinces dedicated to that ſaint. Many ſenſible people of the country, however, differ in opinion from Dr. Serao and other authors, who have ridiculed the pretended diſorder, and affirmed, that the venom of this ſpecies of ſpider can produce no effects but ſuch as are common to all others. The Brindiſians ſay, that the tarantulas ſent to Naples for the experiment were not of the true ſort, but a much larger and more innocent one; and that the length of the journey, and want of food, had weakened their power ſo much as to ſuffer the doctor or others to put their arm into the bag where they were kept with impunity. They quote many examples of perſons bitten as they ſlept out in the fields during the hot months, who grew languid, ſtupid, deprived of all courage and elaſticity, till the ſound of ſome favourite tune rouſed them to dance, and throw off the poiſon. Theſe arguments, however, Mr. Swinburn thinks of little weight; for they acknowledged that elderly perſons were more frequently infected than young ones; and that moſt of them were women, and thoſe unmarried. No perſon above the loweſt rank in life was ever ſeized with this malady, nor is there an inſtance of its cauſing death. The length of the dance, and the patient's power of bearing ſuch exceſſive fatigue in the canicular ſeaſon, prove nothing; becauſe every day, at that time of the year, peaſants may be ſeen dancing with equal ſpirit and perſeverance, though they do not pretend to be ſeized with the tarantiſm. The illneſs may therefore be attributed to hyſterics, exceſſive heat, ſtoppage of perſpiration, and other effects of ſleeping out of doors in a hot ſummer air, which is always extremely dangerous, if not mortal, in moſt parts of Italy. Violent exerciſe may have been found to be a certain cure for this diſorder, and continued by tradition, though the date and circumſtances of this diſcovery have been long buried in oblivion; a natural paſſion for dancing, imitation, cuſtom of the country, and a deſire of raiſing contributions upon the ſpectators, are probably the real motives which inſpire the *tarantati*. Before Serao's experiments, the tarantula had been proved to be harmleſs, from trials made in 1693, by Clarizio, and in 1740 at Lucera, by other naturaliſts.

ARANEOLOGY. It is well known that many animals are influenced by natural electricity, and extremely ſuſceptible of every variation of the atmoſphere. Of theſe, none are more affected than the garden ſpider. To M. Quartremer d'Iſgonval, aid de camp general of the late combined French and Batavian army, the world are indebted for the important diſcovery of being able to rely on garden ſpiders, with as much, if not more confidence, than on the catgut or mercurial barometers. The garden ſpider, according to his obſervations, have two ways of working, according to prevailing or future weather. If the weather is to be rainy, or windy, they attach ſparingly their principal threads, which ſuſpend their whole fabric, and thus they wait for the effect of a temperature, which is about to be very mutable. Spiders, like barometers, poſſeſs not only future, but a more diſtant preſentiment than theſe, concerning what is about to take place in the atmoſphere. A good barometer will foretel the weather until the next day, but when the ſpiders work with long threads, there is a certainty of having fine weather for twelve days or a fortnight, at leaſt! when they are idle, it denotes rain or wind.

when they work ſparingly, it prognoſticates changeable weather: but when they work abundantly, it may be regarded as a ſure forerunner of fine weather. As ſoon as the ſpider is perceived inceſſantly renovating the web, deſtroyed by the continual effuſions of rain, it not only is a criterion of their being of ſhort duration, but alſo denotes a ſpeedy return of a greater permanence of fine weather.

The above is transcribed from the Scots Magazine for February 1798. *Since the Editor first saw the article, he has had no opportunity of enquiring into its correctness. If, however, the observations which it contains, are just, it is certainly of great importance. He has, therefore, thought proper to give it a place in this work, in order that such gentlemen as are curious in such matters may invesigate the subject, and draw their own conclusions.*

ARANJUEZ, a town in the province of New-Caſtile, where the king of Spain has a palace and gardens, which are reckoned the moſt delightful in the world. It lies about 20 miles S. of Madrid. Above a million ſterling has been laid out for the improvement of Aranjuez ſince 1763, and it muſt be acknowledged that wonders have been performed: ſeveral fine ſtreets drawn in ſtraight lines with broad pavements, a double row of trees before the houſes, and a very grand road in the middle; commodious hotels for the miniſters and ambaſſadors; great ſquares, markets, churches, and a theatre have been raiſed from the ground; beſides the acceſſion of two new wings to the palace, and an amphitheatre for that relict of Gothic barbarity, *bull-baiting*. Neatneſs and convenience have been more ſtudied than ſhow in the architecture, but altogether, the place has ſomething truly magnificent in the coup d'œil.

ARARAT, in ancient geography, the mountain on which Noah's ark reſted, after the abatement of the waters of the univerſal deluge. Concerning this mountain there are various conjectures; though it is almoſt univerſally allowed to be in Armenia Major. Some are of opinion that it is one of the mountains which divide Armenia on the ſouth from Meſopotamia and that part of Aſſyria inhabited by the *Curds;* from whom theſe mountains took the name of *Curdu*, or *Cardu*, by the Greeks turned into *Gordyæe*, &c.—Others, that it lies towards the middle of Armenia, near the river Araxes, above 280 miles diſtant from the abovementioned mountains, making it belong to Mount Taurus; but the Armenians are poſitive that Noah's Ararat is no other than a mountain to which they now give the name of *Masis*, which lies about 12 leagues to the eaſt of Erivon, and four leagues from the Aras. It is encompaſſed by ſeveral petty hills: On the tops of them are found many ruins, thought to have been the buildings of the firſt men, who were, for ſome time, afraid to deſcend into the plains. It ſtands by itſelf, in form of a ſugar-lorf, in the midſt of a very large plain, detached, as it were, from the other mountains of Armenia, which make a long chain. It conſiſts, properly ſpeaking, of two hills; the leſſer of which is the more ſharp and pointed; the higher, on which it is ſaid the ark reſted, lies N. W. of it, and riſes far above the neighbouring mountains. It ſeems ſo high and big, that, when the air is clear, it may be ſeen four or five days journey off; yet travellers think the height is not extraordinary. They therefore ſuppoſe that its being viſible at ſuch a great diſtance is owing to its lonely ſituation in a vaſt plain, and upon the moſt elevated part of the country, without any mountains before it to obſtruct the view. Nor is the ſnow with which it is always covered from the middle upwards, any argument of its height; for, in this country, ice hath often been obſerved in the mornings of the middle of July. (See Armenia.) Certain it is, however, that this mountain hath never yet been aſcended; which may very probably be owing to the exceſſive cold.

ARAXES, or Aras, a river of Armenia Major, which takes its riſe in a mountain called *Albos*, where the Euphrates alſo hath its origin. Some have imagined that it hath its riſe in Mount Ararat; but Tournefort aſſures us that it comes no nearer that mountain than 12 miles. The Araxes is a very rapid river, and is ſuppoſed to be the Gihon mentioned by Moſes. Such is the vehemence of its current after the thawing of the adjacent ſnows, or ſome fierce rains, that neither banks nor dykes can reſiſt it. Nothing can exceed the noiſe and violence of its waves at ſuch times: but in winter, when its waters are low, it is fordable in ſome places on camels.

ARBITER, *n. s.* 1. A judge appointed by the parties, to whoſe determination they voluntarily ſubmit.—2. One who has the power of deciſion or regulation; a judge.

ARBITRAMENT, *n. s.* will; determination; choice. This ſhould be written *arbitrement*.

ARBITRARILY, *adv.* with no other rule than the will; deſpotically; abſolutely.

ARBITRARINESS, *n. s.* tyranny.

ARBITRARIOUS, *adj.* and Arbitrariously, *adv.* more properly arbitrary, arbitrarily, which ſee.

ARBITRARY, *adj.* 1. Deſpotic; abſolute.—2. Depending on no rule; capricious.

To ARBITRATE, *v. a.* 1. To decide; to determine. 2. To judge of.

To Arbitrate, *v. n.* to give judgement.

ARBITRATION, *n. s.* The determination of a cauſe by a judge mutually agreed on by the parties contending.

Arbitration, in law, is where the parties, injuring and injured, ſubmit all matters in diſpute, concerning any perſonal chattels or perſonal wrong, to the judgment of two or more arbiters or arbitrators; who are to decide the controverſy; and if they do not agree, it is uſual to add, that another perſon be called in as an umpire, to whoſe ſole judgment it is then referred. Sometimes there is only one arbitrator originally appointed. This deciſion, in any of theſe caſes, is called an *award*. And thereby the queſtion is as fully determined, and the right transferred or ſettled, as it could have been by the agreement of the parties, or judgment of a court of juſtice. See Law.

ARBITRATOR, *n. s.* 1. An extraordinary judge between party and party, choſen by their mutual conſent.—2. A governor; a preſident.—3. He who has the power of preſcribing to others without limit or controul.—4. The determiner; he that puts an end to any affair.

ARBITREMENT, *n. s.* See Arbitrament.

ARBOR, in botany, a tree. Trees are by Linnæus claſſed in the ſeventh family of the vegetable kingdom, and are diſtinguiſhed from ſhrubs in that their ſtems come up with buds on them; but this diſtinction holds not univerſally, there being rarely any buds on the large trees in India.

ARBOREOUS, *adj.* belonging to trees; conſtituting a tree.—2. A term in botany, to diſtinguiſh ſuch funguſſes or moſſes as grow upon trees, from thoſe which grow on the ground.

ARBORIST, *n. s.* a naturaliſt who makes trees his ſtudy

ARBOUR, *n. s.* a bower; a place covered with green branches of trees.

ARBUTUS, the STRAWBERRY TREE: A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 18th order, bicornes. The calyx is divided into five parts; the corolla is ovated; and the fruit is a berry with five cells. There are five ſpecies: viz.

1. The ACADIENSIS, a native of Arcadia.

2. The ALPINA or MOUNTAIN STRAWBERRY TREE, a native of Britain.

3. The ANDRACHNE, or the ORIENTAL STRAWBERRY TREE; ſo called, becauſe it grows plentifully in many parts of the Eaſt; where the natives uſe it for various purpoſes.

4. The UNEDO, or common ſtrawberry tree, is a native of Italy, Spain, and Ireland; and is now very common in the Britiſh gardens. Of this ſpecies there are four varieties, viz. The oblong fruited, the round fruited, the red-flowered, and the double bloſſomed. One deſcription is nearly common to them all; and their inconſiderable variation is almoſt ſufficiently ſhown in their reſpective appellations.

5. The UVA URSI is a plant lately diſcovered in the Highlands of Scotland, and which formerly was thought not to be a native of Britain.

ARC, *n, s.* 1. A ſegment; a part of a circle; not more than a ſemicircle.—2. An arch.

ARCADE, *n. s.* a continued arch; a walk arched over.

ARCANUM, *n. s. in the plural* arcana. A Latin word ſignifying a ſecret.

ARCH, *adj.* 1. Chief; of the firſt claſs.—2. Waggiſh; mirthful; triflingly miſchievous. It is pronounced variouſly in compoſition with regard to the *ch*, which before a conſonant ſound as in *cheese*, as, *archdeacon;* before a vowel like *k*, as *archangel*.

ARCH, *n. s.* 1. Part of a circle, not more than the half. —2. The ſky, or vault of heaven.—3. In architecture, a concave or hollow piece of building, conſtructed in ſuch a manner that the ſeveral ſtones of which it is compoſed keep one another in their places. The terms *arch* and *vault* properly differ only in this, that the arch expreſſes a narrower, and the vault a broader, piece of the ſame kind. The principal difference in the form of arches is, that ſome are circular, and others elliptical; the former having a larger or ſmaller part of a circle, the other of an ellipſis. What are called *strait arches*, are thoſe frequently uſed over doors and windows, the upper and under edges of which are ſtrait and parallel, and the ends and joints all pointing toward a centre. For a more particular account of the different ſorts of arches, &c. ſee ARCHITECTURE.

ARCHANGEL, *n. s.* one of the higheſt order of angels.

ARCHANGEL, in geography, a city of Ruſſia, in the province of Dwina, ſituated on the E. ſide of the river Dwina, about 6 miles from the White Sea, 300 N. of Moſcow, and 400 N. E. of Peterſburgh. The city extends about three miles in length and one in breadth. It ſends, during winter, great quantities of cod to Peterſburgh, frozen. It ſupplies the government of Archangel, part of thoſe of Niſhnei-Novogorod and Caſan, with European commodities; and draws in exchange from thoſe parts corn, flax, hemp, coarſe linen, cordage, ſails, maſts, and tallow, which are moſtly conveyed by the Dwina: It forms alſo a principal communication with the northern and weſtern parts of Siberia, from whence the merchants procure furs, ſkins, and iron. The houſes of Archangel are generally of wood, but well contrived; and every chamber is provided with a ſtove, as a fence againſt the cold, which is here exceſſive in winter. But notwithſtanding the cold, there is always plenty of good proviſions; butcher's meat, poultry, wild fowl, and fiſh, in great variety, and ſold ſurpriſingly cheap. It lies in 64. 34. N. Lat. and 114. E. Long.

ARCHANGELIC, *adj.* belonging to archangels.

ARCHBISHOP, *n. s.* a biſhop of the firſt claſs, who ſuperintends the conduct of other biſhops in his ſuffragans. Archbiſhops were not known in the eaſt till about the year 320; and though there were ſome ſoon after this who had the title, yet that was only a perſonal honour, by which the biſhops of conſiderable cities were diſtinguiſhed. It was not till of late that archbiſhops became metropolitans, and had ſuffragans under them. Athanaſius appears to be the firſt who uſed the title *Archbishop*, which he gave occaſionally to his predeceſſor; Gregory Nazianzen, in like manner, gave it to Athanaſius; not that either of them were intitled to any juriſdiction, or even any precedence in virtue of it. Among the Latins, Iſidore Hiſpalenſis is the firſt who ſpeaks of archbiſhops. He diſtinguiſhes four orders or degrees in the eccleſiaſtical hierarchy, viz. patriarchs, archbiſhops, metropolitans, and biſhops. England has two archbiſhops, viz. thoſe of Canterbury and York. Ireland four, thoſe of Armagh, Dublin, Caſhil, and Tuam. Scotland, while epiſcopacy prevailed in that country had two, thoſe of St. Andrews and Glaſgow—And France previous to the late revolution had ſeventeen.

ARCHBISHOPRICK, *n. s.* the ſtate or juriſdiction of an archbiſhop.

ARCHDEACON, *n. s.* one who ſupplies the biſhop's place and office in ſuch matters as belong to the epiſcopal function. The Engliſh law ſtyles him the biſhop's vicar, or vicegerent. His jurſdiction extends either over the whole dioceſe or a part of it. He is uſually appointed by the biſhop himſelf; and hath a kind of epiſcopal authority, originally derived from the biſhop, but now independent and diſtinct from his. He therefore viſits the clergy; and has his ſeparate court for puniſhment of offenders by ſpiritual cenſures, and for hearing all other cauſes of eccleſiaſtical cognizance. There are 60 archdeacons in England.

ARCHDEACONRY, *n. s.* the office or juriſdiction of an archdeacon.

ARCHDEACONSHIP, *n. s.* the office of an archdeacon.

ARCHDUKE, *n. s.* a title given to ſome ſovereign princes, as of Auſtria, and formerly of Tuſcany.

ARCHED, *part. adj.* bent in the form of an arch.

ARCHER, *n. s.* he who ſhoots with a bow; he who carries a bow in battle. Archers were much employed in former times: but they are now laid aſide, excepting in Turkey and ſome of the eaſtern countries; where there are companies of archers ſtill ſubſiſting in their armies, and with which they did terrible execution at the battle of

Lepanto.—But though archery is not now uſed in war it continues to be practiſed as a manly exerciſe by the inhabitants of Geneva, and in many parts of Flanders; nor is it totally neglected in Great Britain. There are ſeveral ſocieties of archers in England; the chief of which are, the *Woodmen of Arden*, and the *Toxophilites*. But the moſt noted ſociety of this kind now exiſting, is the *Royal Company of Archers* in Scotland. The ancient records of this company having been deſtroyed by fire about the beginning of the preſent century, no authentic traces of their inſtitution now remain. It is ſaid that they owe their origin to the commiſſioners appointed in the reign of James I. of Scotland, for enforcing and overſeeing the exerciſe of archery in different counties. Thoſe commiſſioners, who were in general men of rank and power, picking out amongſt thoſe under their cognizance, the moſt expert archers, formed them into a company, and upon perilous occaſions made a proffer of their ſervices to the king as his chief body guards; in which ſituation they often diſtinguiſhed themſelves for their loyalty, their ſkill, and courage in archery. At this period, the Royal Company conſiſted, as it does at preſent, of the principal nobility and gentry of Scotland. But their unfortunate partiality to the family of Stuart was, at various after periods, the cauſe of a temporary proſperity and decline. Theſe unhappy differences of opinion having totally ſubſided, the Royal Company are now more numerous and flouriſhing than ever, and perhaps even more dexterous archers. They at preſent conſiſt of above 1000 members, among whom are moſt of the Scottiſh nobility of the firſt diſtinction. A number of the Company meet weekly during the ſummer ſeaſon in Edinburgh, in the meadows, where they exerciſe themſelves in ſhooting at butts: And in the adjoining ground they have a handſome building, erected within theſe 12 years, with ſuitable offices, whither they adjourn after their exerciſe, and where they hold their elections and other meetings relative to the buſineſs of the ſociety. Their uniform is tartan, lined with white, and trimmed with green and white fringes; a white ſaſh, with green toſſels; and a blue bonnet, with a St. Andrew's croſs and feathers.

ARCHERY, *n. s.* the art or exerciſe of ſhooting with a bow and arrow. It is known to every one, that, previous to the uſe of fire arms, the bow was the principal implement of war, and by the expertneſs of the archers alone was often decided the fate of battles and of empires.

ARCHES, a village in Berkſhire.

ARCHES-COURT, *n. s.* the chief and moſt ancient conſiſtory that belongs to the archbiſhop of Canterbury, for the debating of ſpiritual cauſes, ſo called from Bow-church of London, where it is kept, whoſe top is raiſed of ſtone pillars, built *arch-wiſe*.

ARCHETYPE, *n. s.* the original of which any reſemblance is made.

ARCHIEPISCOPAL, *adj.* belonging to an archbiſhop.

ARCHIPELAGO, formerly called the Ægean Sea, is that part of the Mediterranean, which lies between Europe and Aſia: having the Morea, Lividia and Macedonia on the W. Romania on the N. Natolia on the E. and the iſle of Candia on the S. It contains a great number of iſlands; ſuch as Andros, Antiparos, Argentiera, Cerigo, Delos, Lemnos, Milo, Metelin, Naxia, Negropont, Paros, Patmos, Rhodes, Samos, Santorin, Scio, Scyros, Tenedos, Tina, &c. All theſe iſlands lie between the 35th and 40th degrees of N. lat. and from 102. to 113. N. long. Some of them are called CYCLADES, becauſe they form, as it were, a crown and circle round Delos; others are called SPORADES, as being diſperſed, without any order, between Aſia and the iſle of Candia.

ARCHIPELAGO, NORTHERN, extends between the E. coaſt of Kamtſchatka, and the W. coaſt of America, and comprehends four cluſters of iſlands: viz. 1. Saſignan, containing five iſlands; 2. Khao, including eight iſlands; both theſe groups together are called the Aleuthian iſlands; 3. the Andreanoffski Oſtrova, compriſes 16 iſlands; and 4. the Lyſſie, or Fox iſlands, include alſo 16 iſlands. Modern geographers mention other Archipelagos; ſuch as, the Archipelago of Lazarus, of Mexico, of the Philippines, which is alſo called by ſome writers the GREAT ARCHIPELAGO.

ARCHITECT, *n. s.* 1. A profeſſor of the art of building.—2. A builder.—3. The contriver of any thing. Or it may be more properly defined, a perſon ſkilled in architecture, or the art of building, who forms plans and deſigns for edifices, conducts the works, and directs the ſeveral artificers employed in it. The importance of the profeſſion of an architect, requires a man to be poſſeſſed of very ſuperior talents; and his practical knowledge, together with his ſtudy, very much matured. A very ingenious man of the profeſſion has declared it neceſſary, a perſon ſhould live three ordinary lives to be in full poſſeſſion of all that is requiſite to make a complete architect: yet how many bold adventurers do we ſee, who do not heſitate to aſſume that character, and to practiſe as profeſſors, although not really poſſeſſed of any one of the numerous qualifications neceſſary to be underſtood to entitle them to the leaſt claim. It is a ſcience of ſo extenſive a nature, that, to attain a full knowledge of it, requires the ſkill of an uncommon genius, together with much ſcientific experience, like its rival arts, painting and ſculpture, (only with much greater variety) and not to be eaſily attained, unleſs nature is uncommonly bountiful in her aid. There are various branches in building, and each, though not equally difficult to comprehend, has its different profeſſors: but the architect muſt take the whole in view, and have a good general knowledge of them all. Vitruvius, in his firſt book of architecture, calls it a ſcience, attended with a great diverſity of ſtudy, and requiring a peculiar knowledge to judge of all the branches belonging to it; that it is partly founded on theory and partly on practice. That the theory explains and demonſtrates the convenience and proportions requiſite to form the fabric; and the practical conſiſts in the actual and continual execution of deſigns: and that, when united in an architect, makes his abilities the moſt accompliſhed.

Deſigning and drawing are moſt eſſential to deſcribe the artiſts ideas on paper, to his employers and the workmen. Geometry to conſtruct the works on true principles: Optics, to judge of effects and the perſpective in all points of view: Arithmetic, to form calculations of the value of works, and the admeaſurement and proportions thereof: Hiſtory, to judge of the claſſical ſtyle and manner of the ancients, according to the various periods of the fluctuation of the arts: Judgment, to form proper ideas of ſituations beſt to build on, quality of materials, &c. Muſic, to judge of ſounds, and their operations in different conſtructed rooms, and of harmoniac proportions, ſo very applicable to architectural forms; and Hydraulics, to manage the neceſſary operations of water.

Beſides theſe already mentioned by Vitruvius, much more practical knowledge is very eſſential to judge well of natural and artificial foundations proper to build upon; and of the quality, quantity and value of all materials, neceſſary and proper to build with, viz. the chalk, lime, ſand, earth, brick, ſtone, timber, tile, ſlate, or ſhingles, metals, &c. To be a good mechanic is a very great and eſſential thing; but it ſhould be blended with ſuperior taſte, to enable the deſigner to judge of effects; for as Wotton ſays, " the architect's glory conſiſts in the deſignment and idea of the work." His ambition ſhould be to make the form triumph over the matter. A man may be a very ingenious and good mechanic, and fall ſhort of that judgment: he may alſo be in poſſeſſion of a refined taſte, and very ready at deſign, without the other requiſites: they muſt be united to make an architect capital. In a word, cloſe application to the ſtudy of ancient maſters, and to the remaining works of antiquity, together with judgment and taſte to ſelect, and properly to apply the hints, which ſuch examples afford, joined to a peculiar genius for the ſtudy of this art, are abſolutely neceſſary to render an architect eminent in his profeſſion.

ARCHITECTIVE, *adj.* that performs the work of architecture.

ARCHITECTOGRAPHIA, the deſcription of ancient buildings, temples, theatres, arches, pyramids, &c.

ARCHITECTURE.

PART I.

INTRODUCTION.

SECT. I. DEFINITIONS *and* DIVISIONS *of* ARCHITECTURE.

ARCHITECTURE, *n. s.* the art or ſcience of building. *Architecture* is divided into *civil architecture*, called by way of eminence *architecture; military architecture*, or fortification; and naval *architecture*, which, beſides building of ſhips and veſſels, includes alſo ports, moles, docks, &c.

To the above definition it is proper to add, that, although ARCHITECTURE, in its utmoſt latitude, may be defined a mathematical ſcience, containing rules for deſigning and raiſing ALL ſorts of ſtructures, according to geometrical proportion; yet, in its ordinary acceptation, and in which we mean here to conſider it, it is applied only to the conſtruction of ſuch buildings, as are neceſſary for the purpoſes of CIVIL life, ſuch as houſes, churches, halls, bridges, porticoes, &c.

SECT. II. HISTORY *of* ANCIENT ARCHITECTURE.

This art, we are aſſured, is as old as Cain: for Moſes tells us that he built a city; though what were the materials, or how the buildings were conſtructed, we are entirely ignorant. It is commonly ſaid, that the firſt materials employed in building were twigs of trees, wherewith men conſtructed huts, ſuch as the *wigwams* in uſe among the American Indians at preſent. This, however, appears diſputable. The natural ſhelter afforded by hollows in the ſides of mountains or rocks, it may be ſuppoſed, would much more readily ſuggeſt the idea of uſing ſtones and earth as materials for building houſes. Indeed, conſidering that tents were not invented before the days of Jabel, Tubal-Cain's brother, it is very probable that ſuch temporary houſes as the Indian wigwams were not originally known; otherwiſe the method of covering poles with the ſkins of beaſts, inſtead of ſmall branches or twigs, muſt very ſoon have taken place.

Theſe temporary houſes ſeem to have come into uſe only when men began to lead an idle wandering life, like the Tartars, and could not be at the trouble of conſtructing durable habitations in every place where they were obliged to wander with their cattle; and Jabel perhaps thus took the hint of making portable houſes or tents. Accordingly we ſee, that no nations, except thoſe who are in a perpetually unſettled ſtate, make uſe of ſuch wretched materials. We are not, therefore, to look for the origin of architecture in any ſingle nation; but in every nation, when the inhabitants began to leave off their ſavage way of life, and to become civilized. The origin of regular building hath been deduced from the conſtruction of the meaneſt huts in a very natural and plauſible manner by ſeveral authors.

" Anciently (ſays Vitruvius) men lived in woods, and inhabited caves; but in time, taking example perhaps from birds, who with great induſtry build their neſts, they made themſelves huts. At firſt they made *theſe huts, very probably*, of a conic figure; becauſe that is a *figure of the ſimpleſt* ſtructure; and, like the birds, whom they imitated, compoſed them of branches of trees, ſpreading them wide at the bottom, and joining them in a point at the top; covering the whole with reeds, leaves, and clay, to ſcreen them from tempeſts and rain.

" But finding the conic figure inconvenient on account of its inclined ſides, they changed both the form and conſtruction of their huts, giving them a cubical figure, and building them in the following manner: Having marked out the ſpace to be occupied by the hut, they fixed in the ground ſeveral trunks of trees to form the ſides, filling the intervals between them with branches cloſely interwoven and covered with clay. The ſides being thus completed, four large beams were placed on the upright trunks; which, being well joined at the angles, kept the ſides firm, and likewiſe ſerved to ſupport the covering or roof of the building, compoſed of many joiſts, on which were laid ſeveral beds of reeds, leaves, and clay.

" Inſenſibly mankind improved in the art of building, and invented methods to make their huts laſting and handſome as well as convenient. They took off the bark, and other unevenneſſes, from the trunks of trees that formed the ſides; raiſed them, probably, above the dirt and humidity, on ſtones; and covered each of them with a flat ſtone or ſlate, to keep off the rain. The ſpaces between the ends of the joiſts were cloſed with clay, wax, or ſome other ſubſtance; and the ends of the joiſts covered with thin boards cut in the manner of triglyphs. The poſition of the roof was likewiſe altered: for being, on account of its flatneſs, unfit to throw off the rains that fell in great abundance during the winter ſeaſon, they raiſed it in the middle; giving it the form of a gable roof, by placing rafters on the joiſts, to ſupport the earth and other materials that compoſed the covering.

"From this ſimple conſtruction the orders of architecture took their riſe. For when buildings of wood were ſet aſide, and men began to erect ſolid and ſtately edifices of ſtone, they imitated the parts which neceſſity had introduced into the primitive huts; in ſo much that the upright trees, with the ſtones at each end of them, were the origin of columns, baſes, and capitals; and the beams, joiſts, rafters, and ſtrata of materials that formed the covering, gave birth to architraves, frizes, triglyphs, and cornices, with the corona, the mutules, the modillions, and the dentils."—See the repreſentations of ancient huts, in plate XX. Fig. 1, 2, and 3.

SECT. III. EARLY STATE *of* ARCHITECTURE *amongst the* EGYPTIANS, PERSIANS, ASSYRIANS, &c.

When arts and learning became famous in Egypt, Perſia, Aſſyria, &c. Architecture flouriſhed: for we find works amazingly elaborate, mentioned among the great deſigners cotemporary with Noah; in the year of the world 2038, the walls of Babylon are reported to have been built by Semiramis; they were very magnificent, and eſteemed one of the Seven Wonders of the World; they regarded the greatneſs rather than the elegance or uſefulneſs of their buildings, as appears from the immenſe magnitude of their pyramids and obeliſks.

There are not wanting, however, ſome modern authors, who endeavour to deprive the ancients of what is juſtly their due, and will have every thing to be exaggerated which ſeems beyond the power of modern princes to accompliſh. In this way Mr. Goguet, remarkably diſtinguiſhes himſelf; and that without giving any reaſon at all, but merely that he takes it into his head. Speaking of the wonders of ancient Babylon, "All theſe works (ſays he) ſo marvellous in the judgment of antiquity, appear to me to have been extremely exaggerated by the authors who have ſpoken of them. How can we conceive, in effect, that the walls of Babylon could have been 318 feet high, and 81 in thickneſs, in a compaſs of near ten leagues?" To this we may eaſily reply, that the pyramids of Egypt, and the immenſe wall which divides China from Tartary, ſhew us, that even ſuch a work as the wall of ancient Babylon is ſaid to have been, is not altogether incredible. The loweſt computation of the dimenſions of the Chineſe wall is, that it extends in length 1200 miles, is 18 feet high at a medium and as many thick; according to which computation, it muſt contain 9,504,000 ſolid fathoms; and yet if we may credit the Chineſe hiſtorians, this immenſe maſs of building was finiſhed in five years. If therefore we can ſuppoſe Nebuchadnezzar, or whoever fortified the city of Babylon, to have been capable of employing as many men for 10 years, as were employed in raiſing the Chineſe wall; we may ſuppoſe him able to have fortified the city of Babylon as ſtrongly as it is ſaid to have been; for the maſs of building is not quite double that of the Chineſe wall, though nearly ſo, amounting to 18,189,600 ſolid fathoms.

The Pyramids or Sepulchres of Egypt, in the deſert of Libya, were wonderful ſtructures; the ground on which the largeſt ſtands containing eleven acres and a quarter, and near five hundred feet high; the baſe of which may be readily compared by the incloſure of Lincoln's-Inn-Fields, London, which Inigo Jones ſet out, with the reported dimenſions of the largeſt of the Egyptian Pyramids.

The Tower of Babel is another remarkable inſtance of the early knowledge of building. The two famous pillars, one of brick, the other of ſtone, erected ſoon after the flood by the ſons of Noah, on which were recorded the remarkable paſſages, from the creation down to the flood; the palace near Andera in Upper Egypt; the ruins of Perſepolis; the amazing Labyrinths; extenſive lakes; gigantic obeliſks; and wonderful ſtaircaſes, &c. are evident teſtimonies of their ſkill, perſeverance, and progreſs in mathematical and architectural arts. Among the ancient Egyptians, Perſians, and Babylonians, the vaſt ſtrength and extent of their buildings ſeem to have been what they chiefly valued; and in this they certainly as much excelled the Greeks and modern nations, as the latter excel them in the beautiful proportion and elegance of their ſtructures.

SECT. IV. RISE *and* PROGRESS *of* ARCHITRCTURE *among the* GREEKS.

The arts were firſt conveyed into Greece by Cadmus (grandſon to Agenor, king of Tyre, 562 years after the walls of Babylon were built) from the Phœnicians, who built Thebes, ſo called from the famous Thebes in Egypt; and we find, that about 300 years after the foundation of Rome was laid, Phidias, an Athenian, built a Temple of the Doric order, whoſe height was 68 feet to the roof; and it is ſaid, the Grecians never made uſe of but one order in the height of their buildings.

Greece was furniſhed with many noble monuments of building which were brought to Rome by Marcellus; viz. The Temple of Jupiter Olympus, the Temple of Cizenis, which Pliny reports was ſo rich and curiouſly wrought, that in all the joints of the ſtone, threads of gold were inlaid to ſeparate them: the Temple of Trallius; of Diana; of Pallas; of Minerva at Athens; of Apollo, &c. all of which teſtify the nobleneſs, uſe, and beauty of architecture, before it was brought to Rome. The forementioned author relates, that Cecrops, the firſt king of Athens, 200 years before the deſtruction of Troy, founded a ſchool for the inſtruction and encouragement of Architects; and to them the invention of three of the regular orders of Architecture are attributed; viz. The Doric, Ionic, and Corinthian; if they collected any ideas of beauty or proportion from the Egyptians, they cultivated, improved, and brought them to perfection; as the orders alluded to, are yet unexampled ſtandards of taſte and beautiful proportion, as appears by the remaining antiquities of that country in various publications. Greece happily perfected the art; but ambitious Rome ſtole Architecture from her; and laid deſolate her glory; the Emperors pulled down her ſtately edifices and temples, and tranſported them to Rome; there they confined

fined the art and materials to raiſe and immortalize themſelves and poſterity.

SECT. V. RISE *and* PROGRESS *of* ARCHITECTURE *among the* ROMANS, *and of the* FIVE ORDERS.

Rome, poſſeſſed of the ineſtimable prize, and at the ſame time ſo extenſive and opulent, ſelected together the greateſt artiſts of thoſe times; who, by their aſſiduity and unwearied purſuits, traced the paths and footſteps of the Grecians, both in learning, arts, and government. Athens furniſhed them with exemplary rules: and, being naturally aſpiring, they ſhone forth in the luſtre and perfection of Architecture, in the various noble ſtructures and temples which they erected to the honour of their emperors, and the victorious conqueſts they made; particularly in their triumphal arches, aqueducts, and baths, which were amazingly rich and elegant: Circi or Circuſes; that of Maximus is ſaid to have been large enough to contain two hundred and ſixty thouſand ſpectators in their proper places. Caracalla cauſed divers parts of it to be ornamented with paint and gilding; and Heliogabalus ordered its floor, on ſome occaſions, to be ſtrewed with gold and ſilver duſt. Columns and obeliſks; their domi or capital houſes; forums; gates; palaces; porticoes; temples in great numbers; theatres and amphitheatres; of which the Coliſeum and the theatre of Marcellus, built by Auguſtus, are beautiful remains of Roman antiquity; alſo mauſoleums, tombs, ſepulchres; luci or groves, &c. &c. Rome, in its flouriſhing ſtate, under the Conſuls and Emperors, who were ſo much diſpoſed to building, at one time is ſaid to have in employ upwards of four hundred architects.

Pompey the Great is reported by Tacitus to have built the firſt amphitheatre at Rome; and Marcellus, happy in victory, together with a fine genius, brought from Greece that moſt beautiful and regular piece of Architecture, called after his name. The magnificence of the Romans in their public buildings, many of which are yet to be ſeen, and others traced by their veſtiges, and which are frequently viſited by admirers of the art, and our modern Architects, who are purſuing the ſtudy, are evident proofs, that the art of Architecture was in their full poſſeſſion for about two centuries, when it declined rapidly as the empire was overturned, after the battle of Actium, when the Goths prevailed, who naturally introduced their own ſtyle of building, which, being grafted to the Roman, produce a miſerable effect. We ſee many inſtances of that clumſy barbarity in various publications, particularly in the views of Venice.

The ORDERS, among ancient and modern architects, are five, viz. The *Tuscan*, the *Doric*, the *Ionic*, the *Corinthian*, and the *Composite*; which are diſtinguiſhed from each other by the column with its baſe and capital, and by the entablature. See plate XXI.

The TUSCAN order is characterized by its plain and robuſt appearance, and is therefore uſed only in works, where ſtrength and plainneſs are wanted; it has been uſed with great effect and elegance, in that durable monument of ancient grandeur, the Trajan column at Rome; indeed, general conſent has eſtabliſhed its proportions for ſuch purpoſes, beyond all others.

The DORIC poſſeſſes nearly the ſame character for ſtrength as the Tuſcan, but is enlivened by its peculiar ornaments; the triglyph, mutule, and guttæ or drops, under the triglyph: theſe decorations characterize the Doric order, and in general are inſeparable from it. Its proportions recommend it where united ſtrength and grandeur are wanted.

The IONIC partakes of more delicacy than either of the former, and therefore, as well as on account of its origin, is called Feminine, and not improperly ſuppoſed to have a matronic appearance. It is a medium between the maſculine Tuſcan and Doric, and the virginal ſlenderneſs of the Corinthian: the boldneſs of the capital, with the beauty of the ſhaft, makes it eligible for porticoes, frontiſpieces, entrances to houſes, &c. Dentils were firſt added to the cornice of this order.

The CORINTHIAN poſſeſſes more delicacy and ornament, than any other order; the beauty and richneſs of the capital, and the delicacy of the pillar, render it the moſt ſuitable in thoſe edifices, where magnificence and elegance are required. On this account, it is frequently uſed for the internal decoration of large ſtate rooms; in which it has a chaſte appearance, though at the ſame time ſuperb.

The COMPOSITE or Roman order is the ſame as the Corinthian in its proportions, and nearly alike in ornamental properties. The addition of the modern Ionic volute to the capital, gives a bolder projection. It is applicable in the ſame caſes as the Corinthian.

The Romans borrowed their architecture from the Greeks, but did not imitate them in the ſtructure of their private dwellings in every particular. Their magnificence, however, in their temples and public buildings, is yet to be ſeen in what remains of them, and which are not only models for all modern architects, but have never been ſurpaſſed, or even equalled, to this day.—But though the art of architecture continued almoſt at its higheſt pitch among the Romans for two centuries, it declined exceedingly as the empire began to fail. Tacitus relates, that after the battle of Actium, no men of genius appeared; and after the reign of Alexander Severus, a manner of building, altogether confuſed and irregular was introduced, wherein nothing of the true graces and majeſty of the former was preſerved.

SECT. VI. HISTORY *of* MODERN ARCHITECTURE.

On the decline of architecture among the Romans, and when the empire was entirely overrun by the Goths, the latter naturally introduced their own methods of building. Like the ancient Egyptians, the Goths ſeem to have been more ſtudious to amaze people with the greatneſs of their buildings than to pleaſe the eye with the regularity of their plans, or the propriety of their ornaments. They corrected themſelves, however, a little by the models of the Roman edifices, which they ſaw before them: but theſe models themſelves were faulty; and the Goths being totally deſtitute of genius, neither architecture nor any other art could be improved by them.

Thoſe ancient buildings in Great-Britain, which have gone under the indiſcriminate denomination of GOTHIC, modern antiquaries have, more accurately, divided into SAXON, NORMAN, and SARACENIC, or that ſpecies vulgarly, though improperly, called MODERN GOTHIC.

Some maintain, that the Saxon churches, after they began to be built with ſtone, conſiſted only of upright walls without pillars or arches, the conſtruction of which, it is alledged, they were entirely ignorant of. But it is highly improbable, that the Saxons could be ignorant of ſo uſeful a contrivance as the arch. Many of them, built by the Romans, they muſt have had before their eyes: and it is not to be believed, that once knowing them and their convenience, they would neglect to uſe, or, having uſed, would relinquiſh them. Beſides, as it appears from undoubted authorities, that they procured workmén from the Continent, to conſtruct their capital buildings, "according to the Roman manner," this alone would be ſufficient to confute that ill founded opinion; and at the ſame time prove, that what we commonly call Saxon, is in reality, Roman architecture.

This ſtyle of building was practiſed all over Europe, and continued to be uſed by the Normans, after their arrival in Britain, till the introduction of what is called the MODERN GOTHIC, which did not happen till about the end of the reign of Henry II. ſo that there ſeems to be little or no ground for a diſtinction between the Saxon and Norman architecture. The ancient parts of moſt Britiſh cathedrals are of this early Norman work, the characteriſtics of which are theſe:

The walls are very thick, generally without buttreſſes; the arches, both within and without, as well as thoſe over the doors and windows, ſemicircular, and ſupported by very clumſy columns, with a kind of regular baſe and capital. In ſhort, plainneſs and ſolidity conſtitute the ſtriking features of this method of building. Yet the architects of thoſe days ſometimes deviated from this rule. Their capitals were adorned with carvings of foliage, and even animals; their maſſive columns exhibited ſmall half columns united to them, and their ſurfaces ornamented with ſpirals, ſquares, lozenge net-work, and other figures, either engraved or in relievo.

Various inſtances of theſe may be ſeen in the cathedral of Canterbury, particularly the under croft, the monaſtery of Lindiſfarn or Holy Iſland, the cathedral at Durham, and the ruined choir at Orford in Suffolk. The columns, fig. 1, 2, 3, 4, pl. XV. are at the monaſtery of Lindiſfarn or Holy Iſland. Thoſe marked fig. 5, 6, 7, are in the ruined chancel at Orford in Suffolk. Fig. 8, is at Chriſt Church, Canterbury. Fig. 9, is a column with two remarkable projections like claws, in the ſouth aiſle of Romſey Church, Hampſhire.

The Saracenical architecture is diſtinguiſhed by its numerous and prominent buttreſſes, its lofty ſpires and pinnacles, its large and ramified windows, its ornamental niches and canopies, its ſculptured ſaints, the delicate lace-work of its fretted roofs, and the profuſion of ornaments indiſcriminately laviſhed. But its moſt diſtinguiſhing characteriſtics are the ſmall cluſtered pillars and pointed arches, formed by the ſegments of two interſecting circles, (ſee pl. XX.) which arches, though adopted laſt, are of a more ſimple and obvious conſtruction than the ſemicircular ones.

It would, however, be too tedious to proceed with a particular hiſtory of the progreſs of architecture in Great Britain or the European continent. A few general remarks ſhall, therefore, ſuffice; after which we ſhall conclude this ſection with ſome obſervations on the ſtate of architecture in the United States. Different æras have been influenced by different taſtes. A peculiar ſtyle of building was adopted to each climate. The Grecians formed into one exquiſite model, the good properties from each of the different ſtyles, and from this ſelection and application reſulted their high-finiſhed graces of architecture. The Romans followed. A ſtyle leſs ſimple and more diffuſe, aided by an additional order, compounded of the various orders of the Greeks, left the laurel of high perfection in their hands. Their taſte became vitiated. The arts accompanied the retrogade of their character, till its final decline, and left that which is called the Gothic taſte, as their laſt feeble effort at refinement.' Religion added, in that rude age, when every thing was wrong, to the wildneſs of conceit, to which the Gothic faſhion was already but too prone. What ſuperſtition appropriates to her own myſteries becomes ſacred, and as ſhe had obtruded her taſteleſs and myſtical alluſions from ſcripture, to the embelliſhment of the heathen converted temples, all her ornaments became beautiful in the eyes of fanatical barbarians. The Gothic architecture firſt triumphed over the arts of Greece and Rome, before the total decline of the empire: and, on the revival of the arts, enjoyed, for centuries, a ſecond victory over æras of refinement, which ought diſdainfully to have rejected it on the reſumption of the claſſic taſte. The churches, abbies, monaſteries, and cathedrals in Europe are all of the Gothic barbarian caſt. Even the caſtles and houſes, imitating their magnificence, bear an affectation of devout ornament, all borrowed from the embelliſhment of the cathedral. To aboliſh this taſte was a work of great difficulty, and even in the ſeventeenth century, and at a period, when architecture had very much exalted herſelf, among her Gothic ruins, Sir Chriſtopher Wren found his noble Grecian model of St. Paul's, which he firſt preſented at court, rejected. Into this beautiful model, he was obliged, in order to comply with pious frivolity of taſte, to interweave enough of the Gothic web, to make St. Paul's, but the ſecond building in the world.

The Americans have a taſte, not corrupted, but ſuſpended in its progreſs. The moment they ſee, what is truly beautiful, they acknowledge its aſcendency. Hitherto they have but little attended to this branch of the fine arts. In reaching at perfection, they will not have to travel through the rubbiſh of Gothic whim and caprice: the Grecian ſchool is open to them; and they ought to adopt its models in all their ſevere and elegant ſimplicity. Their preſent ſtyle is ſlovenly in the higheſt degree; they may, however, ſtep from this ſituation to the higheſt attainments at a ſtride. The evil in our architecture lies principally in this, that we generall build in wood. From this cuſtom, much immediate, as well as remote inconvenience is to be expected; and certainly, however ſuddenly felt may be the comfort ariſing from celerity and diſpatch, the numerous conſiderations of periſhableneſs, want of ſafety, and call for repairs, added to the reflection, that the public taſte is, for the time, deprived of one great field of exertion, will very much weigh with an enlightened people, when once they become 'awakened to their advantages, and proud of the ſingular novelty of their phyſical and moral opportunities of ſituation.

Wood, conſidered as a material of architecture, is not only periſhable, but it is dreadfully acceſſible to all the dangers of wind and fire, and is, by no means as ſtrong as brick or ſtone. To theſe objections, may be added the conſideration, which will weigh with the man of taſte, that wood is unſuſceptible of chaſte ornament. If it be adorned, it is a finical puerile taſte, in which there is as great a diſtance from the ſimplicity of the Grecian, as variance from the whimſical, yet often pleaſantly fanciful aſſemblage of the Gothic ſtyle.

Bachelors only ought to build of wood: men who have but a life eſtate of this world, and who care little for thoſe who come after them. Thoſe who have either children, or a wife to leave behind them, will build of brick, if they wiſh to leave monuments of kindneſs, rather than a rent charge behind them. A well finiſhed brick houſe, however ſmall, is not only more honourable and immediately uſeful and ſafe, but it is cheaper in the end than a wooden one. It needs fewer repairs; its prime coſt is little more; it is a property, which yields more, in as much as if rented out, it carries from the per cent of rent, fewer of the eating repairs, which render the profit of wooden rent rolls ſo equivocal and precarious. With reſpect to inſurance, it bears an analogy to policies on annuities, where one ſubject lingers under a precarious exiſtence, and the other is bleſſed with youth and a ſound conſtitution. In point of eaſe, taſte, and duration, there can be no compariſon between immediate convenience, and the remote advantages of an unknown duration: for a good brick houſe will be habitable for centuries. Conſidered politically, there is this good attending brick buildings: from durable habitations, in which more money has been ſpent, and more of the refined taſtes gratified, an affection for the ſoil is increaſed. A habit of thought ariſes favourable to population, and a greater proportion of money is thus realized. The great national fund is of courſe augmented, fixed to the ſoil, and pledged to the ſociety. But the laſt and higheſt conſideration, which ſtrikes us, is that emigration would be leſs eaſy, and not ſo common amongſt us, were a finer ſpirit of building to prevail. Were the Tartars to build houſes, inſtead of waggons and tents, as baron Tot ſays they ſtill do, and as they did, when the Huns impelled the Goths againſt the feeble Roman empire, they would not rove, and their country might become a land of tillage. The facility with which we *may* move, is a ſtrong incentive to that love of change, which it particularly intereſts us to repreſs in our citizens. There can be no doubt, however, that our ſtyle of building has, within a few years, very conſiderably improved, particularly in our cities; but there is yet open to the taſte and good ſenſe of the people, a very great ſpace, indeed, in which their inventions, taſte, and wealth may be laudably exerted, and we have certainly this circumſtance in our favour, that we are, in this country, leſs confuſed in our ideas of propriety in general than the inhabitants of any other region on the globe. Here we recur to firſt principles with eaſe; becauſe our cuſtoms, taſtes and refinements, are leſs artificial than thoſe of other countries; and, becauſe we act more from the impulſe of an enlightened nature, than from the coercion of the faſhions, impoſed tyrannically by that immenſe opulence, which, in Europe, trifles with nature, and draws its pleaſures from the more inacceſſible reſervoirs of art.

PART II.

PRINCIPLES OF ARCHITECTURE.

SECT. I. INVENTION, TASTE, and JUDGMENT.

We ſhall next view Architecture as one of the fine arts, which will lead us to the examination of ſuch buildings, and parts of buildings, as are calculated ſolely to pleaſe the eye. Variety prevails in the works of nature; but art requires to be guided by rule and compaſs. Hence it is, that in ſuch works of art as imitate nature, the great art is, to hide every appearance of art; which is done by avoiding regularity, and indulging variety. But in works of art that are original, and not imitative, ſuch as architecture, ſtrict regularity and uniformity ought to be ſtudied, ſo far as is conſiſtent with utility. Utility was its original deſtination, and ſtill continues to be its principal end. Experience, however, has taught us, that architecture is capable of exciting a variety of agreeable feelings. Of theſe, utility, grandeur, regularity, order, and proportion, are the chief.

ART. I. INVENTION.

Invention is indiſputably neceſſary to the purpoſe of deſign; the arrangement of rooms or apartments for oratory, ſtate, public buſineſs, viſitors, retiring, eating, reading, ſtudy, dreſſing, living, ſleeping, and other purpoſes, together with their appendages and inferior offices of all denominations required to be annexed thereto, whether of a public or private nature; connexion, convenience and good arrangement, are the great eſſentials.

ART. II. TASTE.

Taſte, for conſtructing and introducing of forms that pleaſe and faſcinate the beholder, with regard to the plan, elevation, ſection, convenience, and beautiful proportions. As to the plan: the arrangement, proportion, and decoration of rooms for the purpoſes they are intended ſeparately; and connected, reſpectively. As to the elevation, character ſuitable to the purpoſe the building is intended for: correctneſs in the ſtyle of architecture made choice of: harmony in the whole maſs of building; and beautiful proportional form of the conſtituent parts of which it is compoſed; if to advance, or recede, to be well connected: in which much optical knowledge muſt be obſerved. Artiſts who deal in the beautiful, love to entertain the eye; palaces and ſumptuous buildings, in which intrinſic beauty may be fully diſplayed, give them an opportunity of exerting their taſte. But ſuch a propenſity is peculiarly unhappy with regard to private dwelling-houſes; becauſe, in theſe, relative beauty cannot be diſplayed to perfection, without hurting intrinſic beauty.

ART. III. JUDGMENT.

Judgment, geometrical and philoſophical; the geometrical conſiſts in conſtructing the building upon true principles, that the architect may form his deſign, ſo as it may be put into execution with firmneſs and durable materials, and that the artiſt makes the beſt of ſuch as are attainable. The philoſophical conſiſts in the knowledge of the quality of materials of all kinds, and to judge what are moſt proper.

per for the intended purpoſe, and of foundations natural and artificial; alſo earths, waters, metals, timber, &c. An ingenious author on the ſubject of proportions of external and internal objects, ſays, that "proportion requires our niceſt application to attain. To ſee on a conſiderable eminence the length of a front trifling, and the height diſproportioned, would appear as abſurd, as to behold a front in a vale long and extended, and elevated only one ſtory;" and this choice muſt likewiſe be dependent upon rules; for as the jarring of inſtruments by blind chance cannot poſſibly pleaſe the ear, ſo the diſproportion of the parts of any object muſt naturally ſhock the eye; and in both unerring rules muſt ſo proportion the ſounds, and diſpoſe the parts, as the whole may be a complete harmony.

With reſpect to buildings of every kind, one rule, dictated by utility is, that they be firm or ſtable. Another dictated by beauty is, that they alſo appear ſo to the eye: for every thing that appears tottering, and in hazard of tumbling down, produceth in the ſpectator the painful emotion of fear, inſtead of the pleaſing emotion of beauty. The unwearied propenſity to make a houſe regular as well as convenient, obliges the architect, in ſome articles, to ſacrifice convenience to regularity; and, in others, regularity to convenience; and accordingly the houſe which turns out neither regular nor convenient, never fails to diſpleaſe.

Architecture being a uſeful as well as a fine art, leads us to diſtinguiſh buildings, and parts of buildings, into three kinds, viz. what are intended for uſe only, what for ornament ſolely, and what for both. Buildings intended for utility ſolely, ought in every part to correſpond preciſely to that intention; the leaſt deviation from uſe, though contributing to ornament, will be diſagreeable; for every work of uſe being conſidered as a mean to an end, its perfection as a mean is the capital circumſtance, and every other beauty in oppoſition is neglected as improper. On the other hand, in ſuch things as are intended ſolely for ornament, as columns, obeliſks, triumphal arches, &c. beauty alone ought to be regarded.

Sect. II. Beauty *ariſing from* Proportion.

It is ludicrous to obſerve writers acknowledging the neceſſity of accurate proportions, and yet differing widely about them. Laying aſide reaſoning and philoſophy, one fact univerſally agreed on ought to have undeceived them, that the ſame proportions which pleaſe in a model, are not agreeable in a large building: a room 48 feet in length, and 24 in breadth and height, is well proportioned: but a room 12 feet wide and high, and 24 long, approaches to a gallery.

For illuſtrating this point, we ſhall add a few examples of the agreeableneſs of different proportions. In a ſumptuous edifice, the capital rooms ſhould be large, otherwiſe they will not be proportioned to the ſize of the building: for the ſame reaſon a very large room is improper in a ſmall houſe. But in things thus related, the mind requires not a preciſe or ſingle proportion, rejecting all others: on the contrary, many different proportions are equally agreeable. It is only when a proportion becomes looſe and diſtant, that the agreeableneſs abates, and at laſt vaniſhes. Accordingly, in buildings, rooms of different proportions are found to be equally agreeable, even where the proportion is not influenced by utility. With regard to the proportion, the height of a room ſhould bear to the length and breadth, it muſt be extremely arbitrary, conſidering the uncertainty of the eye as to the height of the room when it exceeds 16 or 17 feet. In columns, again, every Architect muſt confeſs that the proportion of height and thickneſs varies betwixt 8 diameters and 10, and that every proportion between theſe two extremes is agreeable. Beſides, there muſt certainly be a further variation of proportion, depending on the ſize of the column. A row of columns 10 feet high, and a row twice that height, requires different proportions: The intercolumniations muſt alſo differ in proportion according to the height of the row.

Proportion of parts is not only itſelf a beauty, but is inſeparably connected with a beauty of the higheſt reliſh, that of concord and harmony: which will be plain from what follows: A room, the parts of which are all finely adjuſted to each other, ſtrikes us not only with the beauty of proportion, but with a pleaſure far ſuperior. The length, the breadth, the height, the windows, raiſe each of them a ſeparate emotion. Theſe emotions are ſimilar; and, though faint when ſeparately felt they produce in conjunction the emotion of concord or harmony, which is very pleaſant. On the other hand, where the length of a room far exceeds the breadth, the mind comparing together parts ſo intimately connected, immediately perceives a diſagreement or diſproportion which diſguſts. Hence a long gallery, however convenient for exerciſe, is not an agreeable figure of a room.

External proportion is very much to be attended to, in the country particularly, and where the whole, or any part of the building becomes an object on the approach, or ſeen by paſſengers; but in town, the caſe is generally different, as few houſes are detached; but where they are, or made conſpicuous, a very nice obſervation, and regard to proportion, become neceſſary.

Sect. III. Intrinsic *and* Relative Beauty.

In conſidering attentively the beauty of viſible objects, we diſcover two kinds:—The firſt may be termed *intrinſic* beauty, becauſe it is diſcovered in a ſingle object, without relation to any other. The ſecond may be termed *relative* beauty, being founded on a combination of relative objects. Architecture admits of both kinds. We ſhall firſt give a few examples of relative beauty. The proportions of a door are determined by the uſe to which it is deſtined. The door of a dwelling-houſe, which ought to correſpond to the human ſize, is confined to ſeven or eight feet in height, and three or four in breadth. The proportions proper for a ſtable or coach-houſe are different. The door of a church ought to be wide, in order to afford an eaſy paſſage for a multitude; and its height muſt be regulated by its wideneſs, that the proportion may pleaſe the eye. The ſize of the windows ought always to be proportioned to that of the room they are deſtined to illuminate; for if the apertures be not large enough to convey light to every corner, the room muſt be unequally lighted, which is a great deformity. Steps of ſtairs ſhould likewiſe be accommodated to the human figure, without regarding any other proportion: they are accordingly the ſame in large and in ſmall buildings, becauſe both are inhabited by men of the ſame ſize.

We ſhall next conſider intrinſic beauty, blended with that which is relative. A cube itſelf is more agreeable than a parallelopipedon: this conſtantly holds in ſmall figures: but a large building in the form of a cube is lumpiſh and heavy: while a parallelopipedon, ſet on its ſmaller baſe, is more agreeable on accounts of its elevation. Hence the beauty of Gothic towers. But if this figure were to be uſed in a dwelling-houſe, to make way for relative beauty, we ſhould immediately perceive that utility ought chiefly to be regarded: and this figure, inconvenient by its height, ought to be ſet on its larger baſe: the loftineſs in this caſe would be loſt: but that loſs will be more than ſufficiently compenſated by the additional convenience. Hence the form of buildings ſpread more upon the ground than raiſed in height, is always preferred for a dwelling-houſe.

In buildings deſtined chiefly or ſolely to pleaſe the eye, regularity and proportion are eſſentially neceſſary, becauſe they are the means of producing intrinſic beauty. But a ſkilful artiſt will not confine his view to regularity and proportion: he will alſo ſtudy congruity, which is perceived when the form and ornaments of a ſtructure are ſuited to the purpoſe for which it is appointed. Hence every building ought to have an expreſſion ſuited to its deſtination. A national edifice ought to be ſumptuous and grand: a private dwelling, neat and modeſt: a play-houſe, gay and ſplendid: and a monument, gloomy and melancholy. A church has a deſtination. It is conſidered as a houſe dedicated to the Deity, therefore, it ought to be grand, elevated and magnificent. It is alſo conſidered as a place of worſhip; and, therefore, it has been ſaid, ought to be ſomewhat dark and gloomy, becauſe dimneſs or obſcurity produces that tone of mind, which is favourable to humility and devotion. From this opinion, however, we are obliged to diſſent. A dark and gloomy edifice may aid ſuperſtition; but can be of no utility in producing true and rational devotion. Columns, beſide their chief deſtination of being ſupports contribute to that peculiar expreſſion which the deſtination of a building requires. Columns of different proportions ſerve to expreſs loftineſs, lightneſs, &c. as well as ſtrength. Situation may alſo contribute to expreſſion: Conveniency regulates the ſituation of a private dwelling-houſe; but the ſituation of a public edifice ought to be lofty. This leads to a queſtion, whether the ſituation, where there happens to be no choice, ought, in any meaſure, to regulate the form of the edifice? The connection between a great houſe and a neighbouring field, though not extremely intimate, demands however ſome congruity. It would, for example, diſpleaſe us to find an elegant building thrown away upon a wild uncultivated country: congruity requires a poliſhed field for ſuch a building. The old Gothic form of building was well ſuited to the rough uncultivated regions where it was invented; but was very ill adapted to the fine plains of France and Italy.

That celebrated artiſt, the late Sir William Chambers, publiſhed, in the year 1768, a magnificent work, entitled "A Treatiſe on Civil Architecture," wherein he has laid down proportions and meaſurements different from thoſe followed by moſt of the architects in Europe, but now principally adopted in England. From the proportions as laid down in the above mentioned work, we ſhall give ſome extracts in the following ſections.

The moſt conſiderable ornaments uſed in architecture are the five orders of columns, pediments, arches, baluſters, &c. which we ſhall now proceed to deſcribe.

PART III.

OF THE FIVE ORDERS OF ARCHITECTURE.

SECT. I. *Of the* SEVERAL PARTS *and* MEMBERS *of an* ENTIRE ORDER.

The principal parts of an entire order are three; the pedeſtal, ſhaft, and entablature.—Each of theſe are again ſubdivided into three ſmaller parts: The pedeſtal contains the plinth, (ſee Tuſcan order, Pl. XXI.) the dado, and the cornice. The column includes the baſe, the ſhaft, and the capital. The entablature conſiſts of an architrave, a frieze, and a cornice. The names require illuſtration.

1. The PLINTH takes its appellation from *plinthos*, a brick or flat ſquare ſtone on which columns *in the moſt early* ſtate of architecture are ſuppoſed to have ſtood. 2. *The* DADO, or DYE, is ſo called becauſe *it is of a cubic form*. 3. The CORNICE is derived from *coronis*, a top or ſummit; becauſe the cornice is the extreme end or finiſhing of the pedeſtal. 4. The BASE of the column is from *basis*, a foundation or footing for the column. 5. The SHAFT, that long and ſtraight part of a column comprehended between the baſe and capital, is ſo named from *skapto*, to dig, in the manner of a well, round and deep, whoſe inſide reſembles the ſhape of a pillar. 6. The CAPITAL, from *kephale*, or *caput*, the head, which the capital is to a column. 7. The ARCHITRAVE, from *archos*, chief or principal, and *trabs* a beam, becauſe the architrave is the chief ſupport to the whole entablature. 8. The FRIEZE is ſo called from *phrygion*, a border or fringe, which ſome of the ancients uſed to call *zophoros*; becauſe their friezes were uſually enriched with the figures of animals. 9. The CORNICE of the *entablature*, or the crowning part of the entire order is explained above.

Theſe nine principal parts of a complete *order*, the dado and ſhaft excepted, are compoſed of ſmall members, which conſtitute all that ſimple and pleaſing variety of mouldings which adorned the works of the ancients. The names of theſe mouldings allude to their forms, and their forms are adapted to the purpoſes for which they were intended. See Plate XX. fig. 1, 2, 3, 4, 5, 6, 7, 8.

The names of the members, with their origin and uſe, are as follows. The figures refer to the parts numbered in the Doric Order, Plate XXI.

Fig. 1. The FILLET, from the French word *fil*, thread.

2. The CYMATIUM, or *cyma recta*, from *kumation*, a wave; becauſe this member reſembles the ſwelling and concavity of a wave.

3. The CYMA REVERSA, the preceding member inverted.

4. The CORONA, or crown, becauſe it is the principal member of the cornice, and ſerves as a ſhelter to the ſmaller mouldings of the entablature.

5. The OVOLO, from *ovum* an egg; becauſe this member by the ancients was frequently carved in the form of an egg.

6. The CAVETTO, from *cavus*, hollow.

7. The CAPITAL, or upper fillet of the triglyph.

8. The TRIGLYPH, from *triglyphos*, three engravings, compounded of *tri*, three, and *glypho*, to carve or engrave;

in conformity to which, the triglyph has two entire channels and two half ones, with three ſpaces between.

9. The METOPE, the ſpace between one aperture or hole to another; the triglyphs being ſuppoſed to be joiſts that fill the apertures: hence the ſpace between the triglyphs, which forms an exact ſquare, is termed the *metope*.

10. The FRIEZE is explained above.

11. The BAND is the ſame as the fillet.

12. The GUTTÆ, or the DROPS, are of a conic figure.

13. The ARCHITRAVE. See the explanation above.

14. The FACIA, or face; of theſe there are two in the architrave.

15. The ABACUS, from *abax*, a ſhelf or table; or, as ſome ſuppoſe, a title, on which the ancient Greek mathematicians ſtrewed duſt, to draw their geometrical ſchemes on. The word ſeems to have been introduced into architecture on the invention of the Corinthian capital, which took its riſe from an acanthus growing round a baſket. See ABACUS.

16. The OVOLO of the capital, which in this ſituation muſt be conſidered as the baſket round which the acanthus grew.

17. The ANNULETS, ſo called becauſe theſe ſmall fillets encompaſs the capital, like rings joined to each other. The moderns, in place of theſe, generally have a ſmall cavetto.

18. The COLORINÆ, the collar, or neck on the capital.

19. The ASTRAGAL, from *astragalos*, a bone of the heel; or the curvature of the heel, which this member reſembles. The hollow which follows is termed *apophage*, the ESCAPE, becauſe this part of the column appears to fly off.

20 and 22. The upper and lower TORUS, from *toros*, a cable, which this moulding ſomewhat reſembles.

21. The SCOTIA, from *skotia*, darkneſs; becauſe of the ſtrong ſhadow which its concavity produces, and which is increaſed by the projecting torus above.

In ſome of the Doric entablatures, are MUTULES, from *mutuli*, modillions, which are placed perpendicularly over each triglyph, and are of the ſame width; and whoſe projection in the corona is the ſame, forming a perfect ſquare. In others are DENTILS, as in the theatre of Marcellus at Rome. Theſe are ſo named from *dentes*, teeth, which they reſemble; and the flat member on which theſe dentils are placed is termed *denticulus*. The capitals of the Ionic, Corinthian, and Compoſite, have each of them VOLUTES, ſo called from *volutum*, to roll round, as on a ſtaff. Some call the volutes the HORNS of the capital, becauſe they reſemble the twiſting of ram's horns.

Thoſe parts of the different orders which are termed MOULDINGS are only eight in number. (See Pl. XX.) viz. The fillet or cincture to bind the parts. The aſtragal alſo and torus, reſembling ropes or cables, are ſtrong binders and fortifiers of the parts with which they are connected. The ovolo is ſtrong at its extremities, and is therefore fit to ſupport projecting parts. The cyma recta, inverſa, and cavetto, are covering mouldings, which ſerve to ſhelter the other ſmaller members. There are various methods of deſcribing the contours of theſe; but the ſimpleſt, and perhaps the beſt, is to form them of quadrants of circles, as ſhewn in the plate.

An aſſemblage of what are called eſſential parts and mouldings is termed a PROFILE. The moſt perfect profiles are ſuch as are compoſed of few mouldings, varied in form and ſize; and ſo diſpoſed, that the ſtraight and curved ones ſucceed each other alternately. When ornaments are employed in mouldings, ſome of them ſhould be left plain, in order to give a proper repoſe: for when all are ornamented, the figure of the profile is loſt.

SECT. II. ORDERS *of* ARCHITECTURE *in* GENERAL.

An order conſiſts of two principal members, the column and the entablature; each of which is compoſed of three principal parts. Thoſe of the column are the baſe, the ſhaft, and the capital; and thoſe of the entablature are the architrave, the frieze, and the cornice. All theſe are ſubdivided into many leſſer parts, whoſe number, form, and dimenſions characterize each order, and expreſs the degree of ſtrength, delicacy, richneſs, or ſimplicity peculiar to it.

Of the five orders, three are called Grecian; the Doric, the Ionic, and the Corinthian: and two Latin; the Tuſcan, and the Compoſite. The Grecian orders are diſtinguiſhed from the Latin by their deſtination as well as by their ornaments. It has been diſputed whether any new order can be added to theſe: ſome hold the affirmative, and give for inſtances the Tuſcan and the Compoſite; others maintain, that theſe properly are not diſtinct orders, but only the original orders with ſome ſlight variation. The only circumſtances that can ſerve to diſtinguiſh one order from another, are the form of the column, and its deſtination. To make the firſt a diſtinguiſhing mark, without regard to the other, would multiply orders without end. Deſtination is more limited, and it leads us to diſtinguiſh three kinds of orders; one plain and ſtrong, for the purpoſe of ſupporting plain and maſſy buildings; one delicate and graceful, for ſupporting buildings of that character; and between theſe, a third, for ſupporting buildings of a mixed nature. So that, if deſtination alone is to be regarded, the Tuſcan is of the ſame order with the Doric, and the Compoſite with the Corinthian. The ornaments of theſe three orders ought to be ſuited to the purpoſe for which they are intended. Plain and ruſtic ornaments would not be a little diſcordant with the elegance of the Corinthian order; and ſweet and delicate ornaments not leſs ſo with the ſtrength of the Doric.

The ſimpleſt and moſt ſolid of all the orders is the Tuſcan. It is compoſed of few parts, devoid of ornaments, and of a conſtruction ſo maſſive, that it ſeems capable of ſupporting the heavieſt burden: whence it is, by Sir H. Wotton, compared to a ſturdy labourer in homely apparel.

The Doric is next in ſtrength to the Tuſcan; and, being of a grave, robuſt, and maſculine aſpect, is by Scamozzi called the Herculean. As it is the moſt ancient of all the orders, it retains more of the ſtructure of primitive huts than any of the reſt; having triglyphs in its frieze to repreſent the ends of the joiſts; and mutules in its cornice, to repreſent the rafters; its column being likewiſe, in various antiques, executed without a baſe, in imitation of the trees uſed in the firſt buildings, without any plinths to raiſe them above the ground.

The Ionic is of a more ſlender make than either of the above-mentioned orders. Its appearance is ſimple, yet graceful and majeſtic; its ornaments are few, nor is there any thing exaggerated, or remarkably ſtriking, in any of its parts: ſo that it is not improperly compared to a ſedate matron, in decent rather than magnificent attire.

The Corinthian, ſays Sir H. Wotton, is a column laſciviouſly decked, like a wanton courtezan. Its proportions are extremely elegant. It is divided into a great variety of members, and enriched with a profuſion of ornaments. Scamozzi calls it the Virginal: and indeed it has all the delicacy in its make, with all the gaiety, gaudineſs, and affectation in its dreſs, peculiar to young girls.

The Compoſite is, properly ſpeaking, only a ſpecies of the Corinthian; and therefore retains, in a great meaſure, the ſame character.

Columns, in the opinion of Scamozzi, ſhould not be leſs than ſeven of their diameters in height, nor more than ten; the former being a good proportion in the Tuſcan, and the latter in the Corinthian order. The practice of the ancients, in their beſt works, is conformable to this precept: for which reaſon, according to the doctrine of Vitruvius, the Tuſcan columns are ſeven diameters in height, the Doric eight, and the Ionic nine, (which Palladio and Vignola have followed) and the Corinthian and Compoſite ten; which laſt is a mean between the proportions obſerved in the Pantheon, and in the Three Columns, both which are accounted excellent models of the Corinthian order.

The height of the entablature, in all the orders, is made one quarter of the height of the column; which was the common practice of the ancients, who, in all ſorts of entablatures, ſeldom exceeded or fell much ſhort of that meaſure. Nevertheleſs Palladio, Scamozzi, Alberti, Barbaro, Cataneo, de L'Orme, and others of the modern architects, have made their entablatures much leſs in the Ionic, Compoſite, and Corinthian orders, than in the Tuſcan or Doric. This, on ſome occaſions, may be not only excuſable, but highly commendable, particularly where the intercolumniations are large, (as in a ſecond or third order,) or in private houſes, or inſide decorations, where lightneſs may be preferred to dignity, and where expence, and every impediment to the conveniency of the fabric, is carefully to be avoided: but to ſet entirely aſide a proportion, which ſeems to have had the general approbation of the ancient artiſts, is preſuming too far.

Of the manners uſed by architects to determine the dimenſions of the mouldings, and the leſſer parts that compoſe an order, the ſimpleſt, readieſt and moſt accurate is by the module, or ſemi-diameter of the column, taken at the bottom of the ſhaft, and divided into thirty minutes.

Monſieur Blondel, in his book entitled *Reſolution des quatre principaux Problemes d'Architecture*, teaches various manners of diminiſhing columns; the beſt and ſimpleſt of which is by means of the inſtrument which Nicomedes invented to deſcribe the firſt conchoid: for this, being applied at the bottom of the ſhaft, performs at one ſweep both the ſwelling and the diminution; giving ſuch a graceful form to the column, that it is univerſally allowed to be the moſt perfect practice hitherto diſcovered. The columns in the Pantheon, accounted the moſt beautiful among the antiques, are made in this manner: as appears by the exact meaſures of one of them to be found in *Deſgodet's Antiquities of Rome*. In the remains of antiquity the quantity of the diminution is various; but ſeldom leſs than one eighth of the inferior diameter of the column, nor more than one ſixth of it. The laſt of theſe is by Vitruvius eſteemed the moſt perfect. As to the parts of a column, a bare uniform cylinder, without a capital, appears naked; and without a baſe, appears too tickliſhly placed to ſtand firm; it ought therefore to have ſome finiſhing at the top and bottom: hence the three chief parts of a column, the ſhaft, the baſe, and the capital. Nature undoubtedly requires proportion among theſe parts, but it admits of variety of proportion. Vitruvius and ſome of the elder writers ſeem to think, that the proportions of columns were derived from the human figure, the capital repreſenting the head, the baſe the feet, and the ſhaft the body. The intention of the plates being to give an exact idea of the orders of the ancients, they are repreſented under ſuch proportions as appear to have been moſt in uſe in the eſteemed works of the Romans; who, in the opinion of Leo. Bap. Alberti, and other eminent writers, carried architecture to its perfection. It muſt not however be imagined that the ſame general proportions will on all occaſions ſucceed. They are chiefly collected from the temples and public ſtructures of antiquity, and may by us be employed in churches, national edifices, and other buildings of magnificence, where majeſty, and grandeur of manner may be extended to their utmoſt limits, and where, the whole body being generally large, the parts require an extraordinary degree of boldneſs, to make them diſtinctly perceptible from the proper point of view; but in leſs conſiderable edifices, and under various circumſtances, other proportions may be preferable.

SECT. III. *Of the* ORIGIN, CHARACTER, USE, *and* PROPORTIONS *of the* TUSCAN ORDER.

This order, as its name evinces, originated in Tuſcany, one of the moſt conſiderable of the ancient Italian ſtates, which was firſt peopled by the Lydians from Aſia. They built temples of this order, and dedicated them to their idols in their new ſettlements. It is the moſt ſolid and ſimple of all the orders. It is compoſed of few parts, devoid of ornaments, and ſo maſſy, that it ſeems capable of ſupporting the heavieſt burden. There are no remains of a regular Tuſcan order among the antiques: the doctrine of Vitruvius concerning it is obſcure; and the profiles of Palladio, Scamozzi, Serlio, de l'Orme, and Vignola, are all imperfect. Vignola's is however preferred by moſt architects; and accordingly, a profile nearly approaching to it is given in Plate XVIII.

The Tuſcan order, on account of its ſtrong and maſſy proportions, has obtained the name of the *ruſtic order*; in conformity to which character, it is generally employed in farm houſes, ſtables, and the like edifices. It is however ſometimes uſed in ſuperior buildings, where ornaments are not required, but where ſtrength is the principal object. The proportion of the Tuſcan column, with its pedeſtal and entablature, is as follows:—Divide the whole height of the entire column into five equal parts, one of which is for the height of the pedeſtal; and the remaining four are deſigned for the baſe, ſhaft, capital, and entablature. The whole height being divided in five equal parts, one is given for the entablature, and the remaining four being divided into ſeven equal parts, one is for the inferior diameter of the ſhaft. In maſſy buildings, a more heavy entablature may be uſed, as was cuſtomary amongſt the ancients. They divided the whole height aſſigned to the baſe, ſhaft, capital, and entablature, into four equal parts, and gave one to the entablature. The profiles of Vignola and Palladio have this proportion.

Take half of the inferior diameter, for the height of the baſe, including the plinth; and the ſame for the height of the capital, excluſive of the aſtragal. Take the inferior diameter, and divide it into 60 equal parts, which are called *minutes*, and by which the ſmaller parts of the columns are proportioned in their height and projections, as ſpecified in the upright and horizontal ſcales attached to the profile, from which the ſeveral proportions of each moulding muſt be learned. A module is conſidered by ſome to be only half a diameter; but others extend it to a whole one, which we have adopted as the moſt ſimple and entire. Palladio uſes the whole diameter in every order except the Doric. Vitruvius alſo employs the large module, reckoning the proportion of the column by the lower or inferior diameter of the ſhaft; and we do not ſee that either the ſemidiameter or the 20 minutes contrived by ſome will more nearly anſwer to the different parts of the column.

SECT. IV. *Of the* INTERCOLUMNIATION *of the* ORDERS.

Columns are either engaged or inſulated; and when inſulated or detached from the wall, they are either very near, or at a conſiderable diſtance from it. When they are placed at a conſiderable diſtance from the wall, they are deſtined to ſupport the entablature; and their diſtance from each other ſhould be conſiſtent both with their real and apparent ſolidity. Engaged columns are attached to the wall, and are not limited in their intercolumniations, as they depend on the breadth of the arches, doors, windows, niches, or other decorations placed in them.

The ancients uſed five different ſpecies of intercolumniations, which, according to Vitruvius and Palladio, are as follows:

I. The PYCNOSTYLE, of which the interval or ſpace is one and a half of the inferior diameter of the column.

II. The SYSTYLE, whoſe interval is two diameters,

III. The EUSTYLE, two diameters and a quarter.

IV. The DIASTYLE, three diameters—and

V. The ARÆOSTYLE, four diameters.

The three firſt of theſe were uſed by the Grecians, in the Doric, Ionic, and Corinthian orders; but the diſtances of the triglyphs of the Doric determined the intercolumniations of that order, which we ſhall deſcribe in its place.

The ancient Romans preferred the EUSTYLE in moſt caſes, as the beſt medium of the too little and too great intervals of columns; but in their Tuſcan works, they uſed a ſpace equal to four and ſometimes ſix diameters, which intercolumniations was admiſſible in this order, ſince the architrave was uſually formed of ſome kind of timber, when the other parts of the entablature were of ſtone. Palladio ſays, this intercolumniation of the Tuſcan order was adapted to farm houſes and other ruſtic works, as it affords a paſſage for carts, and was attended with the leaſt expence. In ſtructures built entirely of ſtone, however, they uſed a ſhorter interval, more ſuitable to the length of their marble blocks, and more agreeable to the ponderous fabric which they occaſionally ſupported: for which reaſon the diaſtyle and euſtyle modes were ſometimes applied to this order.

The moderns have indeed adopted theſe two as their general rule, and apply them to every order except the Doric. The aræoſtyle, however, is ſometimes, by a modern contrivance, authoriſed by a few examples of the ancients, introduced in porticoes and periſtyles. This mode of the aræoſtyle is from Parrault, and is managed by placing two columns together at the angles, ſo cloſe as to admit the two capitals nearly into contact. This manner, which is termed grouping, takes off from the exceſſive width of this kind of interval, whilſt it adds to it both real and apparent ſtrength, as is exemplified in St. Paul's church in London, and in the palace of the Louvre at Paris.

SECT. V. *Of* ARCHES *and their* ORNAMENTS.

Arches are not ſo magnificent as colonnades; but they are more ſolid and leſs expenſive. They are proper for triumphal entrances, gates of cities, of palaces, of gardens, and of parks, and, in general, for all openings that require an extraordinary breadth. There are various manners of adorning arches. Sometimes their piers are ruſticated; ſometimes they are adorned with pilaſters, termini, or caryatides; and ſometimes they are made ſufficiently broad to admit niches or windows.

The circular part of the arch is either ſurrounded with ruſtic key ſtones, or with an archivolt enriched with mouldings; which, in the middle, is ſometimes interrupted by a conſole, or maſk, ſerving at the ſame time as a key to the arch, and as a ſupport to the architrave of the order. The archivolt is ſometimes ſupported by an impoſt, at the head of the pier; and at others by columns placed on each ſide of it, with a regular entablature, or architrave and cornice.

There are likewiſe inſtances of arcades without piers, the arches being turned on ſingle columns, as in the temple of Faunus, at Rome, &c. But this practice ought not to be imitated, as it is neither ſolid nor handſome. When arcades, however, are employed to ornament domeſtic apartments, the breadth of the pier needs not exceed one quarter of the opening of the arch.

When arches are cloſed up, to receive doors, windows, or niches, the receſs ſhould be ſufficient to contain all the projections of what is placed therein, otherwiſe their appearance is clumſy, and will become too principal, which produces a bad effect in the compoſition. When arches are large, the key ſtone ſhould never be omitted, but cut in the form of a conſole, and carried cloſe under the ſoffit of the architrave, which, on account of its extraordinary length, requires a ſupport in the middle. The impoſts of arches ſhould never be omitted; at leaſt, if they be, a platform ought to ſupply their place. If columns are employed without pedeſtals in arcades, they ſhould always be raiſed on a plinth.

In arches of great magnitude, the circular part ought not to ſpring immediately from the impoſt, but take its riſe at ſuch a diſtance above it as is neceſſary in order to have the whole curve ſeen at the proper point of view. The void or aperture of arches ſhould never be higher, nor much lower, than double their breadth; the breadth of the pier ſhould ſeldom exceed two thirds, nor be leſs than one third of the breadth of the arch; and the angular pier ought to be broader than the others, by one half, one third, or one fourth: the impoſt ſhould not be more than one ſeventh, nor leſs than one ninth of the aperture; and the archivolt muſt not be more than one eighth, nor leſs than one tenth of it. The breadth of the conſole muſt, at the bottom, be equal to that of the archivolt; and its ſides muſt be drawn from the centre of the arch: the length of it muſt not be leſs than one and a half of its ſmalleſt breadth, nor more than double. The thickneſs of the pier depends on the breadth of the portico; for it muſt be ſtrong enough to reſiſt the preſſure of the vault. But with regard to the beauty of the building, it ſhould not be leſs than one quarter of the breadth of the arch, nor more than one third. Theſe are the general dimenſions of arches. See Pl. XIII.

The proportions peculiar to the Tuſcan arch, of which we have given an example, without pedeſtals, are as follows: In height, their aperture is ſeven diameters and a quarter, in width four, and from centre to centre of the columns, ſix diameters. According to the preceding remarks, the archivolt and impoſts are half a diameter, and from the top of the archivolt to the under ſide of the architrave ſhould not be leſs than 15 minutes. The breadth of the key ſtone at the bottom is equal to its archivolt; and its ſpreading ſides are determined by lines drawn from the centre of the arch, as is ſhewn in the plate. The plinth is one diameter in height, and the proportions of the column and entablature are the ſame with the Tuſcan profile. For the proportions of the moulding of the archivolt and impoſts, ſee Pl. XIII.

The Tuſcan arch with pedeſtals is in width four and a half, and in height eight diameters and a quarter; and from centre to centre of each pier is ſix and three-quarters. In every other particular they are ſubject to the preceding rules.

Sect. VI. *Of the* Origin, Character, Use, *and* Proportions *of the* Doric Order.

The doric order derived its name from the Dorians, a nation of ancient Achaia, from whom it doubtleſs received the proportions and derived moſt of the parts by which it has been diſtinguiſhed from orders of later date. The Doric, as to its character, is by architects conſidered grave, robuſt, and of maſculine aſpect: hence it is figuratively termed the *Herculean* order. The ancients accordingly uſed it in their temples dedicated to Juno, Minerva, Mars, and Hercules, whoſe grave and heroic diſpoſitions ſuited well the ſolemn character of this order.

This order may be properly uſed in colonnades, porticoes, halls, gates of cities, and public buildings erected in memory of heroes, or famous perſonages. In moſt of the antiques, the Doric column is executed without a baſe. Vitruvius makes it without one; the baſe, according to him, having been firſt employed in the Ionic order, in imitation of the ſandals worn on women's feet. Scamozzi blames this practice, and moſt of the moderns are of his way of thinking.

The remarks of Le Clerc, in oppoſition to De Chambre, are worthy of notice. The latter aſſerts, that the Doric column is after the model of a ſtrong man, who is conſtantly repreſented bare footed. He alſo obſerves, that the baſe to a column is the ſame as a ſhoe to a man, and therefore cenſures the uſe of a baſe as improper and unchaſte. Le Clerk admits, that the moſt ancient Dorics were deſtitute of baſes, though he conſiders it difficult to aſſign any good reaſon for it. "But I muſt own, (ſays he) I cannot conſider a column without a baſe, in comparing it to a man, but I am at the ſame time ſtruck with the idea of a perſon without feet rather than ſhoes: for which reaſon I am inclinable to believe, either that the architects of antiquity had not yet thought of employing baſes to their columns, or that they omitted them in order to have the pavement clear; the angles and projections of baſes being ſtumbling blocks to paſſengers, and ſo much the more troubleſome, as the architects of thoſe times frequently placed their columns very near each other: ſo that had they been made with baſes, the paſſages between them would have been extremely narrow and inconvenient; and it was doubtleſs for the ſame reaſon that Vitruvius made the plinths of his Tuſcan column round; that order, according to his conſtruction, being particularly adapted to ſervile and commercial purpoſes, where convenience is preferable to beauty. However this be, perſons of good taſte will grant, that a baſe not only gives a graceful turn to the column, but is likewiſe of real uſe, ſerving to keep it firm on its plan; and that if columns without baſes are now ſet aſide, it is a mark of the wiſdom of our architects, rather than an indication of their being governed by prejudice, as ſome adorers of antiquity would inſinuate."

In conformity to the arguments of this celebrated author, and agreeably to the practice of Palladio and of our modern architects, we have introduced an attic baſe to this order; yet, in ornamental temples, for gardens, &c. we are decidedly of opinion, that the Grecian ſtyle ſhould be copied ſtrictly and preſerved chaſte, according to the remains of antiquity, as diſcovered by both ancient and modern architects, who have with great diligence and expence explored their ruinous piles, to obtain accurate meaſurements of the ſeveral parts.

The other members which mark the peculiar feature of this order are the triglyph and mutule. The mutules are conſidered as a memorial or imitation of the primitive huts (ſee Pl. XX. Fig. 2, and 3,) whoſe beams are ſeen to project outwardly under the roof; but the triglyph is thought by ſome to be emblematical of the uſe of the firſt temple erected according to this order, which was dedicated to Apollo, to whoſe harp the triglyph bears ſome ſort of reſemblance. The *metope*, or ſpaces between the triglyphs, have been variouſly enriched. Palladio introduced ox's ſculls, with lighted torches hanging from each horon, and placed alternately with pateras, expreſſive of the ſacrificial offerings performed to the heathen deities.

Various other ornaments may, however, be introduced with propriety, both in public and private buildings, agreeably to the taſte of the architect. When this order is employed in churches and other religious edifices, the metope may have cherubs, chalices, doves, garlands of palm and olive, and other devices, emblematical of moral virtues: the moſt elevated parts of all theſe ſhould project little more than the triglyph. This rule was ſtrictly obſerved by the ancients, who ſeldom gave their ornaments more projection than that of the borders in which they were incloſed. Agreeably to this idea, the ſoffits of the corona (ſee Pl. XXI.)

XXI.) have their ornaments within the thickneſs of the borders which receive them.

The following are the proportions of the principal parts of this order, as appear in its profile, in Pl. XVIII. The whole height of the entire order is divided into five equal parts, one of which is the height of the pedeſtal; and the remaining four, which are aſſigned to the column and entablature, are likewiſe to be divided into five. One of theſe belongs to the entablature, and the remaining four being divided into eight equal parts, one of them will be the inferior diameter of the column. Or we may expreſs it thus:

The whole height of the order, including its pedeſtal, is 12 modules and a half, reckoning the module a whole diameter. The pedeſtal is two and a half; the baſe, ſhaft, and capital 8; and the whole entablature two modules. Dividing the large diameter into 60 equal parts, called *minutes;* 30 are given to the baſe, 30 to the capital, 30 to the architrave, 45 to the metope, and 45 to the height of the cornice, including the upper fillet or capital of the triglyph. In this order, when the mutules are introduced in the entablature, as in the example referred to, one module is aſſigned for the projection of the cornice, which, in this reſpect, exceeds any of the other orders. The projection of the mutules is equal to their width, being 30 minutes: the width of the triglyphs is exactly the ſame, and their diſtance from each other equal to the height of the metope, which, by this diviſion, forms a perfect ſquare. The ſides of the channels of the triglyphs are at right angles with each other. The manner of dividing and drawing them, together with the conic drops, may be learned from Pl. XV. The ſoffit of the mutule, and that of the corona, are frequently ornamented; the former with conical drops, ſimilar to thoſe under the triglyphs, and the latter with roſes in ſquare and lozenge compartments. (See Pl. XV.) The proportions of the ſmaller parts, and of the ſeveral mouldings which compoſe the whole, muſt in this, and in every other order, be learned from their reſpective profiles.

Names *of the* different parts, *referred to by* Figures *in the repreſentation of the* Doric Order; Pl. XXI.

Cornice. 1. The Fillet. 2. The Cymatium. 3. The Cyma reverſa. 4. The Corona. 5. The Ovola. 6. The Cavetto. 7. The Capital of the Triglyph. The Frieze. 8. The Triglyph. 9. Metope. 10. The Frieze. The Architrave. 11. The Band or Tœnia. 12. The Drops. 13. The Architrave. 14. Ditto firſt Facia. The Capital. 15. O. G. and Abacus. 16. The Ovolo. 17. The Annulets. 18. The Colorino. 19. The Aſtragal.

The Base of the Shaft. 20. The Upper Torus. 21. The Scotia. 22. The Lower Torus. 23. The Plinth. The Capital of the Pedestal. 24. The Cyma inverted. 25. The Facia. 26. The Hollow. 27. The Dado. The Base of the Pedestal. 28. The Aſtragal. 29. The Cyma. 30. The Plynth.

Sect. VII. *Of the* Intercolumniation *and* Arches *of the* Doric Order.

The intercolumniation of this order is often attended with peculiar difficulty, ariſing from the ſtrict regard that is ever paid to the due width of the triglyph, and the perfectly ſquare form of the metopes, or their intervals. Beſides, it is abſolutely requiſite, that a triglyph ſhould be placed exactly over the centre of every column. For theſe reaſons, the mutules and triglyphs have been omitted in capital works, both ancient and modern, as in the Coliſeum at Rome, and the Royal Hoſpital at Greenwich.

Palladio has, however, given one inſtance of an ancient temple, with angular triglyphs. This ſtructure, which he terms the *Temple of Piety*, is mentioned by Vitruvius, with an eye to the difficulty occaſioned by the triglyphs being thus placed; which reduces the intercolumniation of the two angular columns to one diameter and a quarter, which is leſs than pycnoſtyle. The next intercolumniation is ſtill greater, approaching near to the pieroſtyle, as is evidently neceſſary to bring the triglyph over the centre of the third column from the angle. The next, which is the centre intercolumniation, and faces the entrance of the temple, is rather more than the euſtyle, or two diameters and a quarter; and has, in the metopes, ditriglyph. But the intervals between the triglyph are much too narrow for their height, ſo as to produce an unfavourable effect. The other ſpaces are monotriglyph, and are perfect. The regular intercolumniation of the Doric order is the monotriglyph, or pycnoſtyle, which admits of one between two columns.—The ditriglyph, or euſtyle, admits two; and the aræoſtyle is tritriglyph, or conſiſting of three; but the moſt perfect of theſe is the ditriglyph.

In ſmall buildings, ſuch as temples, and other ſimilar ornaments for gardens, the intercolumniations may be determined, without paying a ſtrict regard to the general rules for the diſtances of columns; always obſerving, however, that ſuch works muſt have an interval that will admit of an eaſy paſſage between them.

Doric arches, without pedeſtals, are ſeven diameters and three fourths high, and in width four diameters and 15 minutes.—The piers are two modules in front, and in thickneſs one module, 22½ minutes; or in proportion to their diſtance from the wall. From centre to centre of each other, is ſix diameters and 15 minutes. Arches of this order, with pedeſtals, have their apertures, in height, nine diameters and 30 minutes; and in their width; five diameters, 15 minutes. The piers are two diameters, 15 minutes wide in front; and from centre to centre of each, is ſeven diameters, and 15 minutes.

Sect. VIII. *Of the* Ionic Order, *with its* Volutes.

Amongſt the ancients, the form of the Ionic profile appears to have been more poſitively determined, than that of any other order: for in all the antiques of Rome, except in the Temple of Concord, it is exactly the ſame.

The proportions of the principal parts of the Ionic column, are as follow: The height of the entire order is divided into five equal parts. One of theſe parts is aſſigned to the height of the pedeſtal; and the remaining four are divided into ſix, for the column and entablature. One of theſe is appropriated to the entablature, and the remaining four are for the column, including its capital and baſe. Theſe four being divided into equal parts, one is aſſigned for the inferior diameter. The cornice is 44 minutes in height, and its projection the ſame. The drip in the under ſide of the corona is channelled out one minute deep, and two minutes from the front; and before the cyma reverſa, one minute.

The ſhaft of the column is ſometimes fluted, and ſometimes plain. Twenty, or 24 are the number of flutes allotted, not only to this, but to every other order. In general, however, 24 are preferable. The plan of the flutes may be rather more than a ſemicircle, as they will then appear more diſtinct. The fillets, or intervals between them, muſt not be broader than one third of the flutes, nor leſs than one fourth: and it ſhould farther be obſerved, that in the capital of rich compoſitions over each flute, is placed an ove or egg. In exterior works, when the building is large, the entablature may be enlarged to one fourth of the whole column without its pedeſtal, as was ſometimes practiſed by the ancients. Palladio, however, makes no diſtinction of this nature; but allows only one fifth part of the height of the column in all caſes.

The VOLUTE, which is a principal member of this column, is executed in various forms. The Grecian volute has a double fillet winding round to its eye, which, by the partings or ſpaces between, produces a variety of light and ſhade, and affords to the whole convolution additional grace and beauty. We are not of opinion, however, that the necking is any additional beauty to the capital, as is ſuppoſed by ſome architects: for the aſtragal certainly takes off from that pleaſing ſimplicity, and pure elegance of the Roman capital, which is uninterrupted by any projecting moulding, till we view the eaſy turn of the volute itſelf. Upon theſe principles, we prefer the Roman capital. Both the Grecian and Roman capitals are ſquare on the front, but have quite a different appearance when viewed on their ſides. It might therefore be eligible, when the decoration is to be continued in flank, as well as in front, to ſubſtitute the angular capital, uſed by Michael Angelo, Scamozzi, and other modern architects, in imitation of thoſe in the Temple of Concord. This capital is alike on all ſides; and therefore, occaſions no difficulty in the management of angular pilaſters or columns: its abacus is drawn in the ſame manner as that of the Corinthian order.

SECT. IX. *Of the* COMPOSITE ORDER.

This order had its origin amongſt the ancient Romans, and Serlio is ſaid to have been its inventor. In its ſtyle of compoſition, it partakes of the Ionic and Corinthian orders, but moſtly of the latter; particularly in the leaves of its capital. Some architects, however, do not incline to ſpeak well of this order, merely on the principle of its being a compoſition from the others. But this, in itſelf, is not a ſufficient ground for objection, ſince the ſame may be ſaid of the Tuſcan order, which is a compoſition from the rude ſtate of the Doric. On the other hand, we freely acknowledge, that the Compoſite order is ſo complete an imitation of the Corinthian, that at firſt ſight, the little difference between them will even deceive the eye of a tolerable judge. This ſhews the compoſition at leaſt defective, if not bad; for why are two orders of architecture ſcarcely to be diſcriminated, but by the eye of a ſkilful architect? In confirmation of this, it may further be obſerved, that this is not the caſe with any other of the orders. The mereſt novice in architecture, can at firſt view diſtinguiſh the Tuſcan order from the Doric, and the Ionic from the Corinthian, as the parts which principally characterize each are ſtrikingly different.

Taking this order, however, as it is, in conformity to the beaten path of cuſtom, its affinity to the Corinthian certainly entitles it to be claſſed in the rank of the rich, delicate and virginal orders. Conſiſtently with this character, it was uſed in temples conſecrated to female deities: and the all conquering Romans, to expreſs their dominion over thoſe nations that invented the orders of which this is compoſed, uſed it more frequently in their triumphal arches, than in any other buildings. Where elegance and magnificence are to be united, it may be employed with propriety, and is adapted for buildings intended to commemorate any ſignal event, or to celebrate the virtues and actions of legiſlators and conquerors: becauſe the capitals and other ornaments may be compoſed of emblems and alluſive repreſentations, agreeably to the practice of the ancients.

The following are the general proportions of this order: The height of the entire order is divided into five equal parts, one of which is appropriated for the height of the pedeſtal, and the remaining four for the column and entablature. Theſe four parts being again divided into ſix; one is for the entablature, and the remaining five, for the height of the column, including its baſe and capital. The height of the column is divided into 10 equal parts, one of which is given to the inferior diameter. The baſe is 30 minutes, the capital 70 in height, adorned with acanthus leaves, and volutes, drawn by the ſame method as thoſe of the Ionic: and the plan of the capital is the ſame with that of the Corinthian order.

The ſoffit of the corona is divided into ſquare compartments, cut out of the ſolid, decorated with roſes, whoſe relief muſt not project more than the borders which incloſe them. In rich compoſitions, the ſoffits of the modilliens are alſo ornamented; but their relief is not to exceed the horizontal ſurface, which would greatly injure the effect of the modillion, and render the appearance of the profile of the entablature leſs pleaſing.

SECT. X. *Of the* CORINTHIAN ORDER.

The lovers of architecture are indebted to the city of Corinth for this fineſt of all architectural compoſitions; in which we ſee proportion, ſimplicity, elegance, and richneſs, combined to a degree almoſt exceeding imagination.

Conformably to the whole of its character, the ancients employed it in works of magnificence, grandeur, and delicacy. It obtained a place in palaces, public ſquares, banqueting rooms, theatres, and the apartments of young ladies. It was alſo generally uſed in temples dedicated to female deities, and ſometimes in thoſe of Jupiter, Mars, and Mercury. The moſt perfect model of the Corinthian order is generally allowed to be ſhewn in the three columns in the Campo Vaccino at Rome, the remains, as it is ſuppoſed, of the temple of Jupiter Stator.

The baſe of the column may be either Attic or Corinthian, ſince both are beautiful. The entablature is generally much enriched, particularly by the ancients, who introduced in the frieze repreſentations of various figures. A very full diſplay of theſe may be found in Stewart's Antiquities of Athens. When the entablature is thus enriched, the columns are fluted, and the flutings may be filled with cablings, one third from the bottom, of the whole height of the ſhaft. In moſt of the antiques at Rome, the capital of this order is decorated with olive-leaves; the acanthus being ſeldom employed but in the Compoſite.

The following are the general proportions of this order; The whole height of the entire order is divided into five equal parts, and one is given for the height of the pedeſtal. The remaining four are divided into ſix equal parts; one is aſſigned for the entablature, and the remaining five are aſſigned to the height of the column including its baſe and capital; which are again divided into equal parts, one of which is for the inferior diameter. The baſe is 30 minutes, and the capital 70 in height. The cornice is 48 minutes, both in height and projection.

The ſoffit of the corona is worked in ſquare compartments, as in the Compoſite; but the ſoffit of the modillion is ornamented with an olive-leaf, the ſame as in the capital. The breadth of the modillion is 10 minutes and a half; and the ſpace between each modillion twice their width. The abacus of the capital is ſometimes plain, and ſometimes fluted, as in the profile. In ſome capitals the volutes riſe higher than the under ſide of the abacus, but the capital looks beſt when they are bounded by its under ſurface.

To determine the plan of a capital according to the ancients, draw a geometrical ſquare whoſe ſides are one diameter and a half. To this ſquare draw diagonals; and on theſe, place from the centre, or their interſection, a ſpace equal to one diameter, through which point lines being drawn at right angles with the diagonals, will determine both the projection and thickneſs of the volutes. For the curvature of the abacus, extend the compaſſes from one angle to the other of the ſide of the abacus; and with this opening, interſect two arches deſcribed from the angles of each horn of the abacus, and the point of interſection will be the centre, by which with the ſame opening of the compaſſes, the concavity of the abacus will be accurately drawn.

SECT. XI. *Of* PILASTERS *in* GENERAL.

Pilaſters differ from columns only in their plan; which is a ſquare, as that of columns is round. Their baſes, capitals, and entablatures, have the ſame parts, with the ſame heights and projections, as thoſe of columns; they are alſo diſtinguiſhed in the ſame manner, by the names of *Tuſcan*, *Doric*, *Ionic*, *Corinthian*, and *Compoſite*.

The column is undoubtedly more perfect than the pilaſter. However, they may be employed with great propriety on many occaſions. Some authors declaim againſt pilaſters, becauſe, according to them, they do not admit of diminution. But this is a miſtake; there being many inſtances, in the remains of antiquity, of their being diminiſhed. Scamozzi always gave his pilaſters the ſame diminution as his columns; Palladio and Inigo Jones have likewiſe diminiſhed them in many of their buildings.

Pilaſters are employed in churches, galleries, halls, and other interior decorations, to ſave room; for, as they ſeldom project beyond the ſolid wall above one quarter of their diameter, and they do not occupy near ſo much ſpace as columns. They are likewiſe uſed in exterior decorations; ſometimes alone, inſtead of columns, on account of their being leſs expenſive; and ſometimes they accompany columns, being placed behind them to ſupport the architraves, where they enter the building, as in the Pantheon at Rome; or, in the ſame line with them, to fortify the angles, as in the Portico of Septimius.

Pilaſters ſhould project one quarter of their diameter beyond the walls, when uſed alone. When placed behind columns, eſpecially if they be very near them, they need not project above one eighth of their diameter. But, when placed on a line with columns, their projection muſt be regulated by that of the columns; and conſequently, it can never be leſs than a ſemi-diameter, even when the columns are engaged as much as poſſible.

The ſhafts of pilaſters are frequently adorned with flutings in the ſame manner as thoſe columns; the plan of which may be a trifle more than a ſemicircle: their number muſt be ſeven on each face, which makes them nearly of the ſame ſize with thoſe of columns. The intervals, or fillets, muſt either be one third or one fourth of the fluting in breadth. The capitals of pilaſters are profiled nearly in the ſame manner as thoſe of columns.

SECT. XII. *Of* ATTICS.

Attics very properly follow the pilaſters; being nothing more than ſquare pillars with their cornices. They had their origin in Athens, where it was for many ages a rule in building to conceal the roof. For this purpoſe, nothing ſerved ſo well as a kind of low or little order ranged in a continued line, ſingly, or with the interruption of baluſters; which, riſing above the reſt of the work and before the roof, hid it perfectly, and placed ſomething agreeable in view. The place of Attics, therefore, is at the uppermoſt extremity of a building, to which they ſerve as a crown, or very properly make a finiſhing for the other orders when they have been uſed in the ſtructure. They muſt never ſtand under any thing except ſuch ornaments as are placed at the very top.

Attics ſhould never exceed in height one third of the height of the order on which they are placed, nor be leſs than one quarter of it. The baſe, dye, and cornice, of which they are compoſed, may bear the ſame proportions to each other as thoſe of pedeſtals do; and the baſe and cornice may be compoſed of the ſame mouldings as thoſe pedeſtals. Sometimes the Attic is continued throughout; at others, it projects, and forms a pilaſter over each column of the order. The breadth of this pilaſter is ſeldom made narrower than the upper diameter of the column below it, and never broader. Its projection may be equal to one quarter of its breadth.

PART IV.

OF THE OTHER NECESSARY OR ORNAMENTAL PARTS OF BUILDINGS.

SECT. I. *Of* PERSIANS, CARYATIDES, *and* TERMINI.

Along with columns and pilaſters, it is ſometimes cuſtomary to employ repreſentations of the human figure, to ſupport entablatures in buildings. The male figures are called *Perſians;* and the females, *Carians*, or *Caryatides*.

The PERSIANS are ſo called from a victory gained over the Perſians by Pauſanias, who having brought home priſoners, ſpoils, and trophies to the Athenians, they fixed upon Perſian figures for thoſe which ſhould ſupport entablatures, and thus kept in mind that there were once Perſian ſlaves in

Athens. To repreſent theſe conquered people in the loweſt ſtate poſſible, they loaded them with the heavieſt entablature, viz. that of the Doric Order. In proceſs of time, however, other figures beſides thoſe of Perſians were introduced, and other entablatures put over them; but the name was ſtill retained.

The proper CARYATIDES are women dreſſed in long robes, after the Aſiatic manner; and the origin of the device was as follows.—The Carians had been long at war with the Athenians; but being at length totally vanquiſhed, their wives were led away captives; and, to perpetuate the memory of this event, trophies were erected, in which figures of women dreſſed in the Caryatic manner, were uſed to ſupport entablatures like the Perſians; and though other female figures were afterwards uſed in the ſame manner, the name of *Caryatides* was always retained.

The ancients made frequent uſe of Perſians and Caryatides, and delighted in diverſifying them a thouſand ways. The modern artiſts have followed their example; and there is a great variety of compoſitions of this kind to be met with in different parts of Europe. Indecent attitudes, diſtorted features, and all monſtrous productions, ought to be avoided, of which there are many examples in Gothic buildings. On the contrary, the attitudes ſhould be ſimple and graceful, the countenance always pleaſing, though varied and ſtrongly marked agreeably to the nature of the object repreſented. See Plate XV.

The Caryatides ſhould never much exceed the human ſize. But the Perſians, or male figures, may be of any ſize; and the larger the better, as they will ſtrike the beholder with greater awe and aſtoniſhment. Perſians may be uſed with propriety in arſenals, galleries of armour, &c. under the figures of captives, heroic virtues, &c. Their entablature ought to be Doric, and bear the ſame proportion to them as to columns of the ſame height. The entablature for Caryatides ought to be either Ionic or Corinthian, according as the character of the figures is more or leſs delicate.

TERMINI are ſometimes employed, inſtead of Perſians or Caryatides, to ſupport the entablatures of monuments, chimney-pieces, and ſuch like compoſitions. Theſe figures owe their origin to the ſtones uſed by the ancients to mark the limits of particular poſſeſſions. Numa Pompilius, to render theſe inviolable, conſecrated the Terminus into a deity, and inſtituted feſtivals and ſacrifices to his honour. In a ſhort time, what was formerly only large upright ſtones, were repreſented in human ſhape, and afterwards introduced as ornaments to temples and other buildings. The termini are now principally uſed as ornaments for gardens and fields.

SECT. II. *Of* PEDIMENTS.

Among the Romans, Pediments were uſed only as coverings to their ſacred buildings, till Cæſar obtained leave to cover his houſe with a pointed roof, after the manner of temples. In the remains of antiquity we meet with two kinds of pediments, the triangular and the circular. The former of theſe are promiſcuouſly applied to cover ſmall or large bodies: but the latter, being of a heavier figure, are never uſed but as coverings to doors, niches, windows, or gates. As a pediment repreſents the roof, it ſhould never be employed but as a finiſhing to the whole compoſition.

The ancients introduced but few pediments into their buildings, uſually contenting themſelves with a ſingle one to adorn the middle or principal part. But ſome of the moderns, and particularly the Italians, have been ſo immoderately fond of them, that their buildings frequently conſiſt of ſcarcely any thing elſe.

The GIRDER being a neceſſary part in the conſtruction of a roof, it is an impropriety to imitate the horizontal entablature of a pediment, by which it is repreſented, to make room for a niche, an arch, or a window.

In regular architecture, no other form of pediments can be admitted beſides the TRIANGULAR and CIRCULAR. Both of them are beautiful; and when a conſiderable number of pediments are introduced, as when a range of windows are adorned with them, theſe two figures may be uſed alternately.

The proportion of pediments depends up their ſize; for the ſame proportions will not do in all caſes. When the baſe of the pediment is ſhort, its height muſt be increaſed; and when the pediment is long, the height muſt be diminiſhed. The beſt proportion for the height is, from one fifth to one fourth of the baſe, according to the extent of the pediment, and the character of the body it covers. The materials of the roof muſt alſo be attended to; for if it be covered with tiles, it will be neceſſary to raiſe it more than one quarter of the baſe, as was the cuſtom of the ancients in their Tuſcan temples.

The TYMPAN is always on a line with the front of the frieze; and when large, admits of various ornaments.

SECT. III. *Of* GATES, DOORS, *and* PIERS.

There are two kinds of entrances, viz. DOORS and GATES. Doors are uſed as entrances to churches and other public buildings, to common dwelling houſes, and apartments: and Gates ſerve for inlets to cities, fortreſſes, parks, gardens, &c. The apertures of gates being always wide, they are generally made in the form of an arch, that figure being the ſtrongeſt. But doors, which are generally of ſmall dimenſions, are commonly parallelograms, and cloſed horizontally. The general proportion of the apertures, both of gates and doors, whether arched or ſquare, is, that the height be about double the breadth.

The moſt common, and indeed almoſt the only ornaments for gates are the piers by which they are ſupported, and which were originally no more than bare poſts into which the hinges of the gate were driven. Though this, however, is the only proper uſe of piers, it muſt be concealed as much as poſſible, and they muſt ſeem as if placed there only for ornament. (See Pl. XX.) As they are to be fixed to the wall before the houſe, ſo they muſt be proportioned to it; and as they are to be ſeen in the ſame view with the front of the houſe, their correſpondence with it is equally neceſſary. They are to be placed on a plinth, and ſomething muſt be allowed by way of ornament and finiſhing at the top.

All the luxuriance of fancy may be employed in the decoration of piers: but it will be proper to obſerve this general rule, that the pier being an inferior building, it muſt never be richer than the front of the houſe. If, for inſtance, the front of the houſe is ornamented with columns of the Doric order, the Ionic muſt be uſed in the piers; and it will be found better to omit columns altogether, than to make uſe of the Tuſcan order for piers in any caſe. If the Ionic or Corinthian orders are employed in the front of the houſe, the Doric or Ionic may be uſed with propriety in the piers. One piece of ornament is almoſt univerſal in piers, namely, a niche with its ſeat, made as if for the convenience of weary travellers. On this account, it will be proper to raiſe the columns on pedeſtals, becauſe the continued moulding from their cap will be a good ornament under the niche. The baſe of the columns ought always to be Attick.

Inſide doors, however ſmall the building may be, ſhould never be narrower than two feet nine inches; nor ſhould they ever, in private houſes, exceed three feet ſix inches in breadth. Their height ſhould at leaſt be ſix feet three or four inches. In churches, palaces, &c. where there is a conſtant ingreſs and egreſs of people, the apertures muſt be larger. The ſmalleſt breadth that can be given to a gate is eight and a half or nine feet, which is but juſt ſufficient for the paſſage of a coach.

SECT. IV. *Of* NICHES *and* STATUES.

It has been cuſtomary in every age to enrich different parts of buildings with repreſentations of the human body. Thus the ancients adorned their temples, baths, theatres, &c. with ſtatues of their deities, heroes, and legiſlators.—The moderns ſtill preſerve the ſame cuſtom, placing in their churches, palaces, &c. ſtatues of illuſtrious perſons, and even groups compoſed of various figures repreſenting occurrences collected from hiſtory, fables, &c. Sometimes theſe ſtatues or groups are detached, raiſed on pedeſtals, and placed contiguous to the walls of a building, or in the middle of a room, court, or public ſquare. But they are moſt frequently placed in cavities made in the walls, called *niches*.

There are two ſorts of NICHES; the one formed like an arch in its elevation, and ſemicircular or ſemielliptical in its plan; the other is parallelogram both in its plan and elevation.—The proportion of both theſe depends on the characters of the ſtatues, or the general form of the groups placed in them. The loweſt are at leaſt a double ſquare in height; and the higheſt never exceed two and a half of their breadth.

When niches are alone in a compoſition, they are generally incloſed in a pannel, formed and proportioned like the apertures of a window, and adorned in the ſame manner. In this caſe the niche is carried quite down to the bottom; but on the ſides and at the top, a ſmall ſpace is left between the niche and the architrave of the pannel. And when niches are intermixed with windows, they may be adorned in the ſame manner with the windows, provided the ornaments be of the ſame figure and dimenſions with thoſe of the windows.

The ſize of the ſtatues depends on the dimenſions of the niches. They ſhould neither be ſo large as to have the appearance of being rammed into the niches, as at Santa Maria Majora at Rome; nor ſo ſmall as to ſeem loſt in them, as in the Pantheon. The diſtance between the outline of the ſtatue and ſide of the nitche ſhould never be leſs than one third of a head, nor more than one half, whether the niche be ſquare or arched; and when it is ſquare, the diſtance from the top of the head to the cieling of the niche ſhould not be greater than the diſtance on the ſides.

Statues are generally raiſed on a plinth, the height of which may be from one third to one half of a head; and ſometimes where the niches are large, the ſtatues may be raiſed on ſmall pedeſtals. The character of the ſtatue ſhould always correſpond with the character of the architecture with which it is ſurrounded. If the order be Doric, Hercules, Jupiter, Mars, Æſculapius, and all male ſtatues, may be introduced: if Ionic, then Apollo, Bacchus, &c. and if Corinthian, Venus, Flora, and others of a delicate nature ſhould be employed.

SECT. V. *Of* CHIMNEY-PIECES.

Among the ancients there are very few examples of chimney-pieces. Neither the Italians nor French have excelled in compoſitions of this kind; but Britain, poſſeſſed of many able ſculptors at different times, has occaſionally ſurpaſſed all other nations, both in taſte of deſign and workmanſhip. The ſize of the chimney muſt be regulated by the dimenſions of the room where it is placed. In the ſmalleſt apartments, the breadth of the aperture ſhould never be leſs than three feet, or three feet ſix inches. In rooms from 20 to 24 feet ſquare, or of equal ſuperficial dimenſions, it may be from four to four and a half feet broad; in thoſe of 24 to 27, from four and a half to five; and in ſuch as exceed theſe dimenſions, the aperture may even be extended to five and a half or ſix feet.

The chimney ſhould always be ſituated ſo as to be immediately ſeen by thoſe who enter the room. The middle of the partition wall is the moſt proper place in halls, ſaloons, and other rooms of paſſage; but in drawing-rooms, dreſſing-rooms, and the like, the middle of the back wall is the beſt ſituation. In bed-rooms, the chimney is always in the middle of one of the partition walls: and in cloſets and other very ſmall places, to ſave room, it is put in a corner.

Wherever two chimneys are uſed in the ſame room, they ſhould be placed either directly facing each other, if in different walls, or at equal diſtances from the centre of the wall in which they both are. The proportion of the apertures of chimney-pieces of a moderate ſize is generally a perfect ſquare; in ſmall ones it is a trifle higher; and in large ones, a trifle lower.

The ornaments of chimney-pieces conſiſt in architraves, friezes, cornices, columns, pilaſters, termini, caryatides, conſoles, and all kinds of ornaments of ſculpture, repreſenting animals and vegetables, &c. likewiſe vaſes, chalices, trophies of arms, &c. In deſigning them regard muſt be had to the nature of the place where they are to be employed. Such as are intended for halls, ſaloons, guard-rooms, galleries, and other large places, muſt be compoſed of large parts, few in number, of diſtinct and ſimple forms, and having a bold relief; but chimney-pieces for drawing-rooms, dreſſing-rooms, &c. may be of a more delicate and complicated nature.

SECT. VI. *Of* STAIR-CASES, *and* HAND-RAILS.

Stair-caſes ought to be ſo conſtructed as to make the aſcent ſafe, agreeable, and eaſy.—To fix on a proper and advantageous

advantageous ſituation, for a ſtair-caſe is often attended with difficulty; but without this the internal convenience and beauty of a houſe will be much injured. Palladio is of opinion, that the entrance to a ſtair-caſe ought to be ſituated ſo as the principal parts of a building may be ſeen before we aſcend the ſteps: and upon this principle it is obſervable, that a more eaſy acceſs is gained to the principal apartments on the ground floor.

To render ſtairs eaſy of aſcent, the height of a ſtep ought not to exceed ſeven inches, nor in any caſe to be leſs than four, but ſix inches is a general height. The breadth of the ſteps ſhould not be leſs than 12 inches, if it can poſſibly be avoided; nor ſhould they ever be more than 18; their length ſhould not exceed 12, nor be leſs than three feet. That the aſcent may be both ſafe and agreeable, it is requiſite alſo to introduce ſome convenient aperture for light, which ought to be as nearly oppoſite to our firſt entrance to the ſtairs, as the nature of the building will admit of. An equal diſtribution of light to each flight of ſtairs ought to be particularly regarded; for which reaſon, theſe apertures or windows are commonly placed at the landings or half ſpaces; though ſometimes the whole is lighted from a dome.

Stair-caſes whoſe plans are circular, are of various kinds. Some wind round a newel or column, in the middle, and the riſes of the ſteps are ſtraight, and ſometimes curved. Others form a well or void ſpace, in the centre. The ſame may be obſerved of thoſe whoſe plans are elliptical: the moſt common however, are thoſe whoſe plans are ſquare or parallelogram.

When a ſtair-caſe winds round a newel, whether its plan be circular or elliptical, the diameter being divided into three equal parts, two are ſet apart for the ſteps, and one for the column. But in circular or elliptical ſtair-caſes that are open, or which form a well in the middle, the diameter is divided into four equal parts; two for the ſteps, and two for the void ſpace in the centre. Modern ſtair-caſes however, have often a kind of well of a mixed form; ſtraight on each ſide, and circular at the returns of each flight. The openings of theſe wells are various in wideneſs, but ſeldom exceed 18 or 20 inches.

Moſt ſtair-caſes, both for convenience and ornament, ought to have HAND-RAILS. Theſe generally begin from the ground by a twiſted ſcroll, which, when ſkilfully managed, produces a very good effect. To aſſiſt in the conſtruction of theſe, we ſhall offer the following obſervations, as illuſtrated by the various figures in Pl. XXIII. In figure 1, we have the plan of the firſt ſtep, formed with a ſcroll to receive the newel poſt and balluſters of the twiſted hand-rail: *a* is the projecting noſing of the ſtep; *b* the thickneſs of the bracket, and *c* the ſtring board. To draw the ſcroll proceed thus: Let the ſpace 1, 3, in fig. 1. be conſidered as equal to the ſpring of the ſcroll from its centre to the ſtraight part of the hand-rail, as from O to 1, fig. 3. Divide 1, 3, into three equal parts; and drawing the line 4, 3, at right angles to 1, 3, make it equal to one more of theſe parts. Draw then the diagonal 4, 1; and from the centre 4, deſcribe the arch 3, 5. Divide the arch into 12 equal parts; and through the diviſions, draw the radii till they interſect the line 3, 1, as at 2, 3, 4, &c. which completes the ſcale for drawing the ſcroll. Suppoſing that the ſeveral radial lines, 1, 2, 3, 4, &c. in fig. 3 are already drawn, proceed thus: Take from fig. 2, the ſpace 3, 2, and place it at fig. 3, from the centre O to 2. On 2, with the ſame opening, fix one foot of the compaſſes, and with the other ſtrike a ſhort curve line, as at C, and from 1 with this opening, deſcribe another, interſecting it at C. From the centre C. thus found, draw the arch 2, 1. Again, from fig. 2, take the ſpace 3, and place it from O, on the radial 3: with this opening, find the centre as before, and draw the arch 3, 2, proceeding in the ſame way with the reſt. By contracting the line 4, 3, in fig. 2, it is evident, that a ſcroll may be drawn more open, or with leſs convolution, as in fig. 4; conſequently, by increaſing the length 4, 3, the ſcroll will acquire more convolution; and therefore we may, by theſe means, vary the ſcroll as we pleaſe. In fig. 5, is ſhewn the pitch board or raking of the ſteps, in order to determine the falling mould of the twiſt. The dotted lines drawn from the hand rail to the pitch-board, ſhew its width, which is to be kept level, as it winds about. The lines *a*, 3, *b*, 2, continued round to D, ſhew how much half the width of the rail riſes on the pitch-board, from its beginning to 3. D. exhibits the ſame pitch-board; and the method of finding the outſide mould for the twiſt of the head rail, after its ſides are ſo ſquared as to be every way in a perpendicular direction to its ground plan. But this cannot be done without firſt finding the mould for the hand-rail, which may be done thus: Conſider B. in fig. 6, as that part of the plan of the hand-rail, comprehended between 1, 3, fig. 3. D. is the pitch-board, which gives the rake or bevel of the hand-rail; which, being divided into any number of equal parts, draw ordinates to the plan B, as *a*, *b*. From the raking line, *e*, *d*, draw the correſponding ordinates at right angles with it; and by the compaſſes transfer the ſeveral ordinates from 3 to G, as, *a*, *b*, to *c*, *d*, and 1, 2, 3, 4, reſpectively: then, by drawing a curve line through theſe points, G. will become an accurate mould for the upper ſide of the hand rail.

As however the twiſt of the hand rail requires a greater ſubſtance of wood than the ſtraight part, this may eaſily be determined thus: Draw the ſquare of the hand-rail on the pitch-board, as *a*, in fig. 7; and parallel lines from the oppoſite angles will ſhew the thickneſs required, as at 1, 2. Agreeably to this, *l*, *m*, *n*, in fig. 8, ſhew the manner of glewing the rail with the additional thickneſs of wood before deſcribed. It is made of ſo many pieces, and varied in glewing, to aſſiſt in more eaſily forming the twiſt. The beſt method, in fact, is to glew theſe in the ſtraight way of the grain, by which, if the wood be properly matched, the whole will appear one ſolid piece. To reduce theſe pieces properly, and to produce in the whole twiſt an agreeable turn, it will be requiſite to have a falling mould, that when each part of the twiſt is ſquared, as in every part to anſwer to a perpendicular line over its plan when placed in its due poſition, it may be applied to the outſide of the rail round the twiſt.

In fig. 5, therefore, conſider D the pitch-board and O P the level of the ſcroll at 3, 4. Take the ſtretch of a line ſuppoſed to be girted from 1, to 3, which transfer to O P at D. Divide each ſide of the angle formed by the raking and level line into any number of equal parts, as 1, 2, 3, each, way, and the points produced by the interſections of the lines drawn from each diviſion, will form a curve, perfectly eaſy and ſufficiently accurate for the purpoſe.

If a ſcroll is required to take its ſpring from any part of the ſecond ſtep, then draw the pitch-board as at fig. 6, and proceed in every particular as before. Fig. 9, is a plan of the hand-rail, including five ſteps, as in cylindrical ſtair-caſes. M is the quarter plan, and D is the pitch of five ſteps; and R the face mould for the hand-rail if it be cut out of the ſolid; if otherwiſe, thin veneers are glewed round a cylinder made for the purpoſe, and on which muſt be marked each ſtep and riſer as ſhewn at A, that the thin ſlips at *b*, for the hand rail, and thoſe at *a*, for the ſtringing board, may be correctly laid down.

SECT. VII. *Of* BALLUSTRADES.

Balluſtrades are ſometimes of real uſe in buildings; and at other times they are only ornamental. Such as are intended for uſe, as when they are employed in ſtair-caſes, before windows, or to incloſe terraces, &c. muſt always be nearly of the ſame height; never exceeding three feet and a half, nor ever leſs than three. But thoſe that are principally deſigned for ornament, as when they finiſh a building, ſhould be proportioned to the architecture they accompany; and their height ought never to exceed four fifths of the height of the entablature on which they are placed: nor ſhould it ever be leſs than two thirds thereof, without counting the zocholo, or plinth, the height of which muſt be ſufficient to leave the whole balluſtrade expoſed to view.

The beſt proportion for balluſtrades is to divide the whole given height into 13 equal parts; eight of theſe for the height of the balluſter; three for the baſe, and two for the cornice or rail; or into 14 (if it be required to make the balluſter leſs,) giving eight parts to the balluſter, four to the baſe, and two to the rail. One of theſe parts may be called a *module;* and being divided into nine minutes, may ſerve to determine the dimenſions of the particular members. The diſtance between two balluſtrades ſhould not exceed half the diameter of the balluſter meaſured in its thickeſt part, nor be leſs than one third of it.

The breadth of the pedeſtals, when they are placed on columns or pilaſters, is regulated by them; the dye never being made broader than the top of the ſhaft, nor much narrower; and when there are neither columns nor pilaſters on the front, the dye ſhould not be much lower than a ſquare, and ſeldom higher. On ſtairs, or other inclined plains, the ſame proportions are to be obſerved as on horizontal ones.

SECT. VIII. *Of* ROOFS.

A plan of the building to be covered ſhould be made, before we begin to the operation of roofing, that we may be able to aſcertain the lengths of the various timbers required for the whole. The particular kinds of coverings practiſed amongſt us are lead, pantiles, plain tiles, ſlates, and ſhingles. Coverings of lead are doubtleſs the beſt and moſt durable of any other; but on account of their expence they are ſeldom choſen, except for magnificent buildings. Lead is now moſt generally uſed on roofs nearly or perfectly flat, where any other kind of covering would not be ſafe. The pitch or perpendicular height of ſuch roof is about two ninths of the width of the building, or rather under what is termed pediment pitch. Pantile coverings may alſo be uſed to low roofs; but their general pitch ought to be about three eighths of the width of the building. Coverings of plain tiles and ſlates are generally allowed the higheſt pitch; becauſe when they are laid on low roofs, the rain will more eaſily find its way between them. Theſe ought to have a pitch, the length of whoſe rafters is three-fourths of their girder; or at leaſt, the ſides of the roof ought to be at right angles with each other. What is ſaid of ſlates and tiles is, likewiſe, applicable to ſhingles: but as this mode of covering, is not only of a very periſhable nature, but likewiſe expoſes buildings to deſtruction by fire, it is hoped, it will ſpeedily be exploded, particularly as tiles and ſlates can be had in abundance, and at an expence proportionably trifling, when we conſider their many ſuperior advantages.

There are alſo various kinds of circular roofs; but thoſe moſt generally uſed are formed in the manner now deſcribed, having ſquare or oblong plans, and timber frames, as in figures 7 and 8, in Plate XXIII. whoſe principal parts are thus named: A is the beam or girder; B, the principal rafter or ſuſpar; C, the king poſt; DD, the ſtruts. Fig. 1, is a truſſed roof, with three king poſts, capable of bearing 70 feet ſpan. Fig. 2, is an M roof, capable of ſupporting the ſame extent. Such roofs are uſeful in caſes where the ſpan is extenſive, and when the pitch is required to be low. This however ſeldom happens in practice; for if there be a middle wall, the roof is made double, as in fig. 9. Eig. 4, 4, ſhews the method of piercing timber, and ſecuring it by bolt: Fig. 5, the method of truſſing a girder with pieces *a*, *b*; Fig. 6, of truſſing a partition.

SECT. IX. *Of* CEILINGS.

Ceilings in churches and temples may be conſidered as the interior coverings of their roofs, as there is nothing between them but the neceſſary framing by which the whole is ſupported. For dwelling-houſes the ſimpleſt and moſt common ſort are thoſe which are flat. Theſe are generally adorned with principal compartments, ſurrounded with mouldings, either let into the ceiling or projecting from it. Their ornaments and mouldings do not require a bold relief; but being near the eye, they muſt be finiſhed with neatneſs and taſte.

Coved ceilings are certainly much more beautiful than flat ones; but their execution is attended with more expence, They are uſed promiſcuouſly in large and ſmall rooms, and occupy from one fifth to one third of the height of the room. But where the architect is at liberty to proportion the height of the room to its ſuperficial dimenſions, the moſt eligible proportion for the cove is one fourth of the whole height of the room. The figure of the cove is commonly either a quadrant of a circle or of an ellipſis, taking its riſe a little above the cornice, and finiſhing at the border round the great pannel in the centre. The border projects ſomewhat beyond the coves on the outer ſide; and on the ſide towards the pannel, it is generally made of ſufficient depth to admit the ornaments of an architrave.

When the profiles of rooms are gilt, the ceilings ought likewiſe to be gilt. The uſual method is to gild all the ornaments, and leave the ground white, pearl-colour, light blue, or any other that may be proper to ſet off the gilding to advantage.

Hiſtorical and other paintings are often introduced with good effect in the centre and angular compartments of large ceilings; and of late an invention of painted ſilk and ſatin in various ornaments from the antique, has been introduced, to adorn the profiles of walls of rooms. Theſe are incloſed pannels, pilaſters, and tablets, according to their ſituation; and, when they have ſuitable gilt mouldings, produce a very pleaſing and ſplendid effect.

PART V.

OF THE ERECTION OF BUILDINGS IN GENERAL.

It is well known, that the durability of a building depends upon the ſolidity of the foundation. The ſkilful architect will, therefore, direct a due ſhare of his attention to this important object.

SECT. I. *Of* FOUNDATIONS.

The beſt foundation is that which conſiſts of gravel or ſtone; but in order to know whether the inferior ſtrata are ſufficient for the ſupport of the building, it will be adviſable to ſink wells at ſome little diſtance. By attending to what is thrown up in the digging theſe, the architect will be acquainted with what lies under the ſtony or gravelly bed which on the ſurface promiſes ſo much ſecurity, and will know what meaſures to take.

But though a ſtony or gravelly bottom is undoubtedly the moſt ſure and firm, where all is ſound beneath, there is no kind of ground which may prove more fallacious. The reaſon is, that ſuch ground often contains abſolute vacuities; nor is rock itſelf, though a foundation upon a rock is ſtrong even to a proverb, free from danger of the ſame kind. Caverns are very frequent in rocky places; and ſhould an heavy building be erected over one of theſe, it might ſuddenly fall down altogether.

To guard againſt accidents of this kind, Palladio adviſes the throwing down great weights forcibly on the ground, and obſerving whether it ſounds hollow, or ſhakes. He ſays, if a drum be placed on the ſuſpected ground near to a veſſel filled with water, a gentle ſtroke will not reſound nor ruffle the ſurface of the water, if the earth be ſolid; but, if it be hollow, the effects produced will very clearly ſhew it.

Where the foundation is gravel, it will be proper to examine the thickneſs of the ſtratum, and the qualities of thoſe that lie under it, as they have appeared in digging. If the bed of gravel is thick, and the under ſtrata of a ſound and firm kind, there needs no aſſiſtance; if otherwiſe, we muſt have recourſe to various methods in order to ſupply the defect. In caſe of boggy earths, or unfirm ſand, piling is one of the moſt common methods of ſecuring a foundation; and, notwithſtanding the natural diſadvantages in ſuch a caſe, piles, when properly executed, make one of the firmeſt and moſt ſecure foundations.

In foundations near the edge of waters, we ſhould always ſound to the very bottom, as many fatal accidents have happened from the ground being undermined by rivers. The ſame method is to be followed when the ground on which we build has been dug or wrought before. It ought never to be truſted in the condition in which it is left; but we muſt dig through it into the ſolid and unmoved ground, and ſome way even into that, according to the weight and ſize of the intended edifice.

It will be proper, however, before the architect begins to lay the foundation of the building, to conſtruct ſuch drains as may be neceſſary for carrying off the rain, or other water, that would otherwiſe be collected and lodged about the houſe. In forming drains for carrying off this water, it will be neceſſary to make large allowance for the different quantities that may be collected at different times. It muſt alſo be conſidered, that water of this kind is always loaded with a vaſt quantity of ſediment, which by continually falling to the bottom will be very apt to choak up the drain, eſpecially thoſe places where there happen to be angles or corners in its courſe. The only method of preventing this is by means of certain cavities diſpoſed at proper diſtances from one another. Into theſe the ſediment will be collected, and they are for that reaſon called *sess-pools*.

All drains ought to be arched over at top, and may be moſt conveniently built of brick. According to their different ſizes, the following proportions of height and thickneſs may be obſerved. If the drain is 18 inches wide, the height of the walls may be one foot, and their thickneſs nine inches; the bottom may be paved with brick laid flatwiſe, and the arch turned four inches. If the drain be 22 inches wide, the ſide walls are then to be one foot three inches in height, and the reſt conſtructed as before. If it be 14 inches wide, the height of the walls may be nine inches, and the ſweep of the arch four. A drain of a yard wide ſhould have the ſame height, and the arch turned over it ought to be nine inches thick. Upon the ſame principles and proportions may other drains of any ſize be conſtructed.

The ſewers and drains being conſtructed in a manner to the proportioned ſize of the intended building, the architect may next proceed to lay the foundation of the walls. Here his firſt care muſt be, that the floor of the foundation muſt be perfectly ſmooth and level. The Italians begin with laying over it an even covering of ſtrong oak plank; and upon that they lay, with the moſt exact care, the firſt courſe of the materials. Whether we take this method, or begin upon the naked floor, all muſt be laid with the utmoſt accuracy by rule and line. When the board plat is laid, a courſe of ſtone is the beſt firſt bed, and this is to be laid without mortar; for lime would make the wood decay, which otherwiſe, in a tolerably good ſoil, will laſt for ages.

The thickneſs of foundation walls, in general, ought to be double that of the walls which they are to ſupport. The looſer the ground, the thicker the foundation wall ought to be; and it will require the ſame addition alſo in proportion to what is to be raiſed upon it. The plane of the ground muſt be perfectly level, that the weight may preſs equally every where: for when it inclines more to one ſide than the other, the wall will ſplit. The foundations muſt diminiſh as they riſe, but the perpendicular is to be exactly kept in the upper and lower parts of the wall; and this caution ought to be obſerved all the way up with the ſame ſtrictneſs. In ſome ground, the foundation may be arched; which will ſave materials and labour, at the ſame time that the ſuperſtructure has an equal ſecurity. This practice is peculiarly ſerviceable where the foundation is piled.

Sect. II. *Of* Walls, Chimneys, Roofs, *and* Floors.

As the foundation walls are to diminiſh in thickneſs, ſo are thoſe alſo which are built upon them. This is neceſſary to ſave expence, but is not abſolutely ſo to ſtrengthen the wall; for it would be no leſs ſtrong, though it were continued all the way to the top of an equal thickneſs, provided the perpendicular was exactly kept. In common houſes built of brick, the general diminution from the bottom to the top is one half the thickneſs at the bottom; the beginning is two bricks, then a brick and a half, and laſtly one brick in thickneſs. In large edifices, the walls muſt be made proportionally thicker; but the diminution is preſerved much in the ſame manner. When ſtones are uſed, regard muſt be had to their nature, and the propriety of their figures for holding one another; and where the wall is to be compoſed of different materials, as ſtone and brick, the heavieſt ought always to be placed undermoſt.

One additional particular reſpecting the ſtrength of a plain wall muſt be obſerved, viz. to fortify its angles. This is beſt done with good ſtone on each ſide, which gives not only a great deal of ſtrength, but a great deal of beauty. Pilaſters properly applied afford great ſtrength to walls. Their beſt diſtance is about every 20 feet, and they ſhould riſe five or ſix inches from the naked of the wall. The openings in a wall are all weakeners, and as the corners require to be the ſtrongeſt parts, there ſhould never be a window very near a corner. Properly, there ſhould always be the breadth of the opening firm to the corner.

Along with the conſtruction of walls, that of the chimneys muſt alſo be conſidered; for errors in the conſtruction of theſe will render the moſt elegant buildings extremely diſagreeable. The common cauſes of **SMOKING** are either that the wind is too much let in above at the mouth of the ſhaft, or the ſmoke is ſtifled below: and ſometimes a higher building, or a great elevation of the ground behind, is the ſource of the miſchief; or laſtly, the room in which the chimney is may be ſo ſmall or cloſe, that there is not a ſufficient current of air to drive up the ſmoke. Almoſt all that can be done, while the walls are conſtructing, to prevent ſmoke, is, to make the chimney vent narrower at bottom than at top: yet this muſt not be carried to an extreme; becauſe the ſmoke will then linger in the upper part, and all the force of the draught will not be able to ſend it up.—For curing ſmoky chimneys in houſes already built, ſee CHIMNEY.

After the walls are finiſhed, the roof is the next conſideration: but concerning it very little can be ſaid, only that its weight muſt be proportioned to the ſtrength of the walls. It muſt be ſo contrived as to preſs equally upon the building; and the inner walls muſt bear their ſhare of the load as well as the outer ones. A roof ought neither to be too maſſy nor too light; as being neceſſary for keeping the walls together by its preſſure, which it is incapable of doing while too light; and if too heavy, it is in danger of throwing them down. Of theſe two extremes, however, the laſt is to be accounted the worſt.

Floors are moſt commonly made of wood; in which caſe, it is neceſſary that it be well ſeaſoned. The floors of the ſame ſtory ſhould be all perfectly on a level; not even a threſhold riſing above the reſt: and if in any part there is a room or cloſet whoſe floor is not perfectly level, it ought not to be left ſo, but raiſed to an equality with the reſt; what is wanting of the true floor being ſupplied by a falſe one.

The floors of low houſes may be made of clay, ox blood, and a moderate portion of ſharp ſand. Theſe three ingredients, beaten thoroughly together and well ſpread, make a firm good floor, and of a beautiful colour. In elegant houſes, the floors of this kind are made of Paris plaſter, beaten and ſifted, and mixed with other ingredients. This may be coloured to any hue by the addition of proper ſubſtances; and, when well worked and laid, makes a very beautiful floor. Beſides theſe, halls, and ſome other good rooms, are paved or floored with marble or ſtone; and this either plain or dotted, or of a variety of colours: but the univerſal practice of carpeting has in a great meaſure ſet aſide ornamental work upon floors. In country buildings, alſo, floors are frequently made of bricks and tiles. Theſe, according to their ſhapes, may be laid in a variety of figures; and they are alſo capable of ſome variation in colour, according to the nature of the earth from which they were made. They may be laid at any time; but thoſe of earth or plaſter, are beſt made in the beginning of ſummer, for the ſake of drying.

Sect. III. *Of the* Distribution *of the* Apartments *of* Houses, &c.

This diſtribution of the apartments of houſes muſt of neceſſity be directed by the way of life in which the inhabitants are engaged. In the country, this is commonly farming; and therefore beſides the houſe for the family, there is alſo neceſſary a barn for the reception of the produce of the ground, a ſtable for cattle, a cart houſe for keeping the utenſils under cover, and ſheds for other uſes.

To accompliſh theſe purpoſes, let a piece of ground be taken of five times the extent of the front of the houſe, and incloſed in the leaſt expenſive manner. Back in the centre of this let the houſe be placed, and in the front of the ground the barn and the ſtable, with the adjoining ſheds. Theſe are to be ſet, one on each ſide, to the extreme meaſure of the incloſed ground: they will thus fill up a part of the entrance, and will leave all about the houſe ſome incloſed ground by way of yard. From the barn to the ſtable may be extended a fence with a gate in the middle, and this gate ought to front the door of the houſe.

The plan of the houſe and out buildings may be made as follows. The door may open into a plain brick paſſage, at the end of which may be carried up a ſmall ſtair-caſe. On one ſide of the paſſage may be a common kitchen; and on the other a large room, which will ſerve the family by way of parlour. Beyond this may ſtand on one ſide the pantry, and on the other the dairy room, the laſt being twice the ſize of the former. They are placed on the ſame ſide with the parlour, on account of the heat of the kitchen, which renders it improper to be near them. On the kitchen ſide, a brew-houſe may very conveniently be placed. More rooms may be added on the ground floor as occaſion requires; and the upper ſtory ſhould be divided into bed-chambers for the family, with garrets over them for the ſervants.

A gentleman's country ſeat muſt be built on a more elegant plan. Here the front may extend 65 feet in length, the depth in the centre being 40 feet, and in each of the wings 45. The offices may be diſpoſed in wings; the kitchen in the one, and the ſtables in the other; both of which, however, may correſpond in their front with the reſt of the building, which they ought alſo to do with one another. Theſe wings may have a projection of 13 feet from the dwelling-houſe, to which they ought to be connected, not by ſtraight lines, but by curves. The beſt proportion of theſe offices to a houſe extended 65 feet in front, is 35 feet. If they are ſmaller the houſe will look gigantic; if larger they will leſſen its aſpect. To a front of 35 feet, a depth of 48 is a very good proportion.

There ought alſo to be a covered communication between the dwelling-houſe and offices, which ſhould not appear to be a plain blank wall, but ought to be ornamented with gates. The arch by which the offices are joined to the dwelling-houſe muſt be proportioned to the extent of the buildings; and there cannot be a better proportion than five feet within the angles of the buildings. The wings which have a projection of 13 feet, will appear to have one of 18, and the light will be agreeably broken.

As to the internal diſtribution of a houſe of this kind, the under ſtory may be conveniently divided into three rooms. The hall, which is in the centre will occupy the whole of the projecting part, having a room on each ſide. The length of the hall muſt be 24 feet, and its breadth 12: the room on each ſide of it muſt be 16 feet long, and 11 wide. Of theſe two front rooms, that on the right hand may be conveniently made a waiting room for perſons of better rank, and that on the left hand a dreſſing room for the maſter of the houſe. Behind the hall may run a paſſage of four feet and an half, leading to the apartments in the hinder part of the houſe and the ſtair-caſe. Theſe may be diſpoſed as follows. Directly behind the hall and this paſſage the ſpace may be occupied by a ſaloon, whoſe length is 24 feet and its breadth 17. On the left hand of the paſſage, behind the hall, is to be placed the grand ſtair-caſe; and as it will not fill the whole depth, a pleaſant common parlour may terminate on that ſide of the houſe. On the other ſide, the paſſage is to lead to the door of the great dining parlour, which may occupy the whole ſpace.

The wing on the right hand may contain the kitchen and offices belonging to it, and the other the ſtables. The front of the right hand wing may be occupied by a kitchen entirely, which will then be 30 feet long and 16½ wide; or it may be made ſmaller, by ſetting off a ſmall room to the right. Twenty-two feet by 16 will then be a good bigneſs. The other room will then have the ſame depth of 16 feet, and the width of the front may be 7½. Beyond the kitchen may ſtand the ſtair-caſe, for which 7½ feet will be a proper allowance; and to the right of this may be a ſcullery 12 feet 10 inches deep from the back front by ſeven in breadth. To the left of the ſtair may be a ſervants' hall 16 feet ſquare, and behind that a larder 12 feet 10 by 14 feet ſix. In the centre of the other wing may be a double coach-houſe: for which there ſhould be allowed the whole breadth of the wing, with 10 feet ſix inches in the clear; and on each ſide of this may be the ſtables.

Bridges.

The proper ſituation for building bridges is eaſily known, and requires no explanation: the only thing to be obſerved is, to make them croſs the ſtream at right angles, for the ſake of the boats that paſs through the arches, with the current of the river; and to prevent the continual ſtriking of the ſtream againſt the piers, which in a long courſe may endanger their being damaged and deſtroyed in the end.

Bridges built for a communication of high roads, ought to be ſo ſtrong and ſubſtantial as to be proof againſt all accident that may happen, to have a free entrance for carriages, afford an eaſy paſſage to the waters, and be properly adapted for navigation, if the river admits of it. Therefore the bridge ought to be at leaſt as long as the river is wide in the time of its greateſt flood: becauſe the ſloping of the waters above may cauſe too great a fall, which may prove dangerous to the veſſels, and occaſion the under gravelling the foundation of the piers and abutments; or, by reducing the paſſage of the water too much in time of a great flood, it might break through the banks of the river, and overflow the adjacent country, which would cauſe very great damages, or if this ſhould not happen, the water might riſe above the arches, and endanger the bridge to be overſet, as has happened in many places.

Architecture, military, the art of building caſtles, forts, &c. See Fortification.

Architecture, naval, the art of building ſhips. See Ship-building.

ARCHITRAVE, *n. s.* in architecture, is that part of the column, or order of a column, which lies immediately upon the capital, and is the loweſt member of the entablature. This member is different in the different orders; and, in building *architrave* doors and windows, the workman frequently follows his own fancy. The *architrave* is ſometimes called the reaſon piece, or maſter beam, in timber buildings, as porticoes, cloyſters, &c. In chimnies it is called the mantle-piece; and over jams of doors, and lintels of windows, hyperthyron.

Architrave windows, of timber, are commonly an ogee raiſed out of the ſolid timber, with a liſt over it; though ſometimes the mouldings are ſtruck, and laid on; and ſometimes cut in brick.

ARCHITYPE, ſee Archetype.

ARCHIVAULT, in architecture, the inner contour of an arch, or a band adorned with mouldings, running over the faces of the arch ſtones, and bearing upon the impoſts. It has only a ſingle face in the Tuſcan order, two faces crowned in the Doric and Ionic, and the ſame mouldings as the architrave in the Corinthian and Compoſite.

ARCHIVES, *n. s. without a ſingular.* The places where records or ancient writings are kept. It is perhaps ſometimes uſed for the writings themſelves.

ARCHIVOLT. See Archivault.

ARCH-MARSHAL, the grand marſhal of the German empire: a dignity belonging to the elector of Saxony, who, in that quality, goes immediately before the emperor, on public ſolemnities, bearing a naked ſword.

ARCH-TREASURER, the grand treaſurer of the German empire. The king of Great-Britain bears this title, as elector of Hanover.

ARCHWISE, *adv.* in the form of an arch.

ARCOT, a large city of Indoſtan, 73 miles from Madraſs, and 217 from Seringapatam. It is governed by a Nabob. Long. 154. E. Lat. 12. 30. N.

ARCTIC, in aſtronomy, an epithet given to the north pole, or the pole raiſed above our horizon. It is called the *arctic pole*, on occaſion of the conſtellation of the little bear, in Greek called *arktos*; the laſt ſtar in the tail thereof nearly points out the north pole.

Arctic circle is a leſſer circle of the ſphere, parallel to the equator, and 23° 30′ diſtant from the north pole: from whence its name. This, and its oppoſite, the *antarctic*, are called the two *polar circles;* and may be conceived to be deſcribed by the motion of the poles of the ecliptic, round the poles of the equator, or of the world. The northern frigid zone begins at the arctic circle.

ARCTIUM, **Burdock**: a genus of the polygamia order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, Compoſitæ-capitatæ: The calyx is globular; with ſcales having hooks reflected at the tops. There are three ſpecies, viz.

1. **Arctium lappa**,
2. **Arctium personata**, and
3. **Arctium tomentosum**,

They are all troubleſome weeds; ſo require no direction for their culture. The tender ſtems of the lappa, or common burdock, however, deprived of the bark, may be boiled and eat like aſparagus. When raw they are good with oil and vinegar. Boys catch bats, by throwing the prickly heads of this ſpecies into the air. Cows and goats eat this herb; ſheep and horſes refuſe it; ſwine are not fond of it. The ſeeds, which have a bitteriſh ſubacrid taſte, are recommended, as very efficacious diuretics, given either in the form of emulſions, or in powder, to the quantity of a dram. The roots, which taſte ſweetiſh, with a ſlight auſterity and bitteriſhneſs, are eſteemed aperient, diuretic, and ſudorific; and ſaid to act without irritation, ſo as to be ſafely ventured upon in acute diſorders.

ARCUATE, *adj.* bent in the form of an arch.

ARCUATILE, *adj.* bent; inflected.

ARCUATION, *n. s.* 1. The act of bending any thing; incurvation.—2. The ſtate of being bent; curvity or crookedneſs.—3. [In gardening.] The method of raiſing by layers ſuch trees as cannot be raiſed from ſeed, or that bear no ſeed, as the elm, lime, alder, willow; and is ſo called from bending down to the ground the branches which ſpring from the offsets or ſtools after they are planted.

ARCUATURE, *n. s.* the bending or curvature of an arch.

ARDEA, in ornithology, a genus of the order of Grallæ. The general characters of this order are: the bill is ſtraight, ſharp, long, and ſomewhat compreſſed, with a furrow that runs from the noſtrils towards the plaint; the noſtrils are linear; and the feet have four toes. Under this genus Linnæus comprehends the grus or crane, the ciconia or ſtork, and the ardea or heron, of other authors. There are 79 ſpecies, of which the following are the moſt remarkable: viz.

1. The **Americana**, or hooping crane of Edwards, is a native of America. See Pl. XIV. The crown of the head and temples are naked and papillous; the forehead, nape of the neck, and prime wing feathers, are black; but the body is white: The under part of the head, as far as the lower chap, is red; the beak is yellowiſh, and jagged at the point; the feet are red, and the prime tail-feathers white. This ſpecies is often ſeen at the mouths of the Savanna, Aratamaha, and other rivers near St. Auguſtine: in ſpring going north to breed, like the common crane, and returning, like that bird, to the ſouth in autumn. In ſummer they are found in Hudſon's Bay, where they arrive in May, and retire in September; and are chiefly met with in unfrequented places, in the neighbourhood of lakes, where they breed. The neſt is made on the ground, compoſed of graſs and feathers. They lay two white eggs, like thoſe of the ſwan, and ſit 20 days; the young are at firſt yellow, changing to white by degrees. Theſe birds have a long loud note, which may be heard at a great diſtance: their food is chiefly worms and inſects, which they ſearch for at the bottom of ponds. The natives of Hudſon's Bay call this ſpecies *wapaw-ucbechauk*.

2. The **Argil**, or **hurgil**, of Ives, is a very large ſpecies; from tip to tip of the wings meaſuring 14 feet 10 inches; and from the tip of the bill to the claws ſeven feet and a half: the bill is 16 inches round at the baſe, of different colours, and nearly of a triangular ſhape; the feathers of the back and wings are very ſtrong, and of an iron colour; thoſe of the breaſt long: over the belly a great deal of down, of a dirty white: the legs and half the thighs are naked; the naked parts full three feet in length. This monſter, as Ives terms it, inhabits Bengal, and is alſo found at Calcutta; at the laſt place called *Hurgil.* It majeſtically ſtalks along before one, and appears at firſt like a naked Indian. On opening one of theſe, a terapin, or land tortoiſe, 10 inches long, was found in its craw, and a large male black cat was found entire in its ſtomach. In Sumatra there is ſaid to be a great variety of the ſtork kind; ſome of a prodigious ſize, and otherwiſe curious; as the *Boorong Cambing;* and *Booringoolar*, &c. The ſame ſpecies ſeems to have been remarked by Mr. Smeathman in Africa, while reſident there; an adult of one of which will often meaſure ſeven feet when ſtanding erect. He deſcribes the plumage much the ſame as in Mr. Ives's bird; adding, that the gape is monſtrouſly wide: the head is covered with white down, thinly diſperſed, appearing not unlike a grey-headed man: on the middle of the neck before, a long conic membrane, like a bladder, ſprinkled very thinly with ſhort down, riſing or falling as the animal moves the beak, and always appearing inflated. Theſe birds are met with in companies. When ſeen at a diſtance, near the mouths of rivers, coming towards an obſerver, which they do with their wings extended, they may well be taken for canoes, upon the ſurface of a ſmooth ſea; when on the ſand banks, for men and women picking up ſhell fiſh or other things on the beach.

3. The **Ciconia**, or white ſtork of Ray, has naked eyeballs, and black prime wing-feathers. The ſkin below the feathers, as alſo the beak, feet, and claws, are of a blood colour. It is a native of Europe, Aſia, and Africa; but is ſeldom or ever to be met with in Italy. The ciconia feeds upon amphibious animals. It is ſuch an enemy to ſerpents that it is reckoned almoſt a crime to kill a ſtork. From this favourable treatment, they are ſeen in Holland and the Low Countries walking unconcerned in the middle of the ſtreets. Storks are birds of paſſage.

4. The **Garzetta**, or egret, is creſted behind; the body is white, the beak black, and the feet greeniſh. It is a moſt elegant bird. It weighs about one pound; and the

length is 24 inches, to the end of the legs 32. The Garzetta or egret was formerly eſteemed in Great-Britain as a very great delicacy at the tables of the great: It is now extirpated from the Britiſh iſlands, but is very common in the ſouth of Europe.

5. The Grus, or common crane of Engliſh authors, has a naked papillous crown; the prime feathers of the wings are black; the body is aſh coloured; the prime feathers of the tail are ragged. This ſpecies is migratory, inhabiting in winter the warmer regions near the tropics, and in ſpring going nearly as far north as the arctic circle, to breed. We are told that they make their neſts in the marſhes, and lay two bluiſh eggs. The young birds are thought very good food. They feed on reptiles of all kinds, as well as on green corn, which laſt they make ſuch havock of as to ruin the farmers wherever they alight.

6. The Herodias, or cristata maxima of Cateſby, is creſted behind, has a duſky-coloured back, reddiſh thighs, and the breaſt ſpeckled with oblong black ſpots. It is four feet and a half when erect; the bill is about eight inches from the angle of the mouth to the end of it; and the creſt is made up of long, narrow, brown feathers, the longeſt being five inches in length, which it can erect and let fall at pleaſure. It is a native of Virginia, and feeds not only upon fiſh and frogs, but on lizards, efts, &c. See Pl. XIV.

7. The Major, or common heron, has a black creſt depending from the back part of the head, an aſh-coloured body, and a black line and belt on the neck and breaſt. It is a native of Europe. This bird is remarkably light in proportion to its bulk, ſcarce weighing three pounds and an half: the length is three feet two inches; the breadth five feet four. The body is very ſmall and always lean; and the ſkin ſcarce thicker than what is called gold-beater's leaf. It muſt be capable of bearing a long abſtinence, as its food, which is fiſh and frogs, cannot be readily got at all times. It commits great devaſtation in ponds; but being unprovided with webs to ſwim, nature has furniſhed it with very long legs to wade after its prey. It perches and builds in trees, and ſometimes in high cliffs over the ſea, commonly in company with others, like rooks. It makes its neſt of ſticks, lines it with wool, and lays five or ſix large eggs of a pale green colour. During incubation, the male paſſes much time with the female. They deſert their neſts during winter, except in February, when they reſort to repair them. This bird is ſaid to be very long-lived. The cincerea of Linnæus is the female of this ſpecies.

8. The Pavonia, or the crowned crane, has an erect briſtly creſt, with the temples and two wattles naked. See Pl. XIV. The head is black; the creſt is yellowiſh, and tipped with black at the top; the wings are white; and the feathers of the tail black, and of an equal length. It is a native of Africa, particularly of the coaſt of Guinea, as far as Cape Verd; at this laſt place they are ſaid to be exceedingly tame, and will often come into the court yards to feed with the poultry.

9. The Stellaris, or the bittern, has a ſmooth head, and is variegated through the body with dark coloured ſpots of different figures and ſizes. It is a native of Europe, and inhabits the fen countries. It is found ſkulking among the reeds and ſedges; and its uſual poſture is with the head and neck erect, and the beak pointed directly upwards. It will ſuffer perſons to come very near it without riſing; and has been known to ſtrike at boys and at ſportſmen, when wounded and unable to make its eſcape. It flies principally about the duſk of the evening, and then riſes in a very ſingular manner, by a ſpiral aſcent, till it is quite out of ſight. It makes a very ſtrange noiſe when it is among the reeds, and a different and very ſingular one as it riſes on the wing in the night. This bird and the heron are very apt to ſtrike at the fowler's eyes when only maimed. The food of the bittern is chiefly frogs; not that it rejects fiſh, for ſmall trouts have been met with in their ſtomachs. Its fleſh has much the flavour of a hare, and nothing of the fiſhineſs of that of the heron.

10. The Violacea, or creſted bittern of Cateſby, has a white creſt; the body is variegated with black and white, and blueiſh below. Theſe birds are ſeen in Carolina in the rainy ſeaſons: but in the Bahama Iſlands, they breed in buſhes, growing among the rocks in prodigious numbers, and are of great uſe to the inhabitants there; who, while theſe birds are young and unable to fly, take them for food. They are, in ſome of theſe rocky iſlands, ſo numerous, that in a few hours two men will load one of their little boats, taking them perching from off the rocks and buſhes, they making no attempt to eſcape, though almoſt full grown. They are called by the Bahamians *crab-catchers*, crabs being what they moſtly ſubſiſt on; yet they are well taſted, and free from any rank or fiſhy ſavour.

ARDENCY, *n. s.* ardour; eagerneſs; warmth of affection.

ARDENT, *adj.* 1. Hot; burning; fiery.—2. Fierce; vehement; having the appearance or quality of fire.—3. Paſſionate; affectionate: uſed generally of deſire.

ARDENT Spirits: ſpirits diſtilled from fermented vegetables, ſo called becauſe they will take fire and burn; ſuch as brandy, rum, arrack, ſpirits of wine, &c.

ARDENTLY, *adv.* eagerly; affectionately.

ARDOUR, *n. s.* 1. Heat.—2. Heat of affection; as, love, deſire, courage.

ARDUITY, *n. s.* height; difficulty.

ARDUOUS, *adj.* 1. Lofty; hard to climb.—2. Difficult.

ARDUOUSNESS, *n. s.* height; difficulty.

ARE, the third perſon plural of the preſent tenſe of the verb *to be;* as young men *are* raſh, old ones *are* cautious.

AREA, *n. s.* 1. The ſurface contained between any lines or boundaries.—2. Any open ſurface, as, the floor of a room; the open part of a church; the vacant part or ſtage of an ampitheatre. In geometry, the ſuperficial contents of any figure. Thus, if a figure, *e. g.* a field, be in form of a ſquare, and its ſides be 40 feet long, its area is ſaid to be 1600 ſquare feet; or it contains 1600 little ſquares, each a foot every way. See Surveying.

ARECA, the fausel-nut, in botany, a genus of the order of palmæ pennatifoliæ. The male has no calyx, but three petals, and nine ſtamina; the female has no calyx; the corolla has three petals, and the calyx is imbricated. There are two ſpecies, viz. the *Cathecu* and the *Oleracea.*

1. The Cathecu is a native of India. It has no branches, but its leaves are very beautiful; the form a round tuft at the top of the trunk, which is as ſtraight as

an arrow. It grows to the height of 25 or 35 feet, and is a great ornament in gardens. The ſhell which contains the fruit is ſmooth without, but rough and hairy within; in which it pretty much reſembles the ſhell of the cocoa nut. Its ſize is equal to that of a pretty large walnut. Its kernel is as big as a nutmeg, to which it bears a reſemblance without, and has alſo the ſame whitiſh veins within when cut in two. In the centre of the fruit, when it is ſoft, is contained a greyiſh and almoſt liquid ſubſtance, which grows hard in proportion as it ripens. The extract of this nut has been ſuppoſed to be the terra japonica of the ſhops, at leaſt that it is a very ſimilar ſubſtance both in colour and taſte: But according to later obſervations, the genuine drug ſeems to be obtained from the MIMOSA *Catechu*. The fruit when ripe is aſtringent, but not unpalatable, and the ſhell is yellowiſh. Of this fruit there is a prodigious conſumption in the Eaſt-Indies, there being ſcarce any perſon, from the richeſt to the pooreſt, who does not make uſe of it; and the trade they drive in it is incredible. The chief uſe that is made of areca is to chew it with the leaves of betel, mixing with it lime made of ſea ſhells. Cornelius le Brun aſſerts, that they rub the leaves of betel with a red drug of Siam, or with white chalk. In order to chew it, they cut the areca into four quarters, and take one quarter of it, which they wrap up in a leaf of betel, over which they lay a little of the lime; afterwards they tie it, by twiſting it round. This bit prepared for maſtication, is called *pinang*; which is a Malayan word uſed all over the Eaſt-Indies. The pinang provokes ſpitting very much, whether it be made with dried or freſh areca; the ſpittle is red, which colour the areca gives it.—This maſtication cools the ſtomach, and faſtens the teeth and gums. When they have done chewing the pinang, they ſpit out the groſs ſubſtance that remains in the mouth. The beſt areca of the Indies comes from Ceylon.

2. The OLERACEA, or true cabbage palm, is the moſt beautiful, and perhaps the talleſt, of all trees. The trunk is perfectly ſtraight, and marked with rings at the veſtigia of the footſtalks of the leaves. Near the ground it is about ſeven feet in circumference; but tapers as it aſcends, and attains the height of 170 or 200 feet. The bark is of an aſh colour, till within 25 or 30 feet of the extremity of the tree; when it alters at once to a deep ſea green, which continues to the top. About five feet from the beginning of the green part upwards, the trunk is ſurrounded with its numerous branches, in a circular manner; all the lowermoſt ſpreading horizontally with great regularity; and the extremities of many of the higher branches bend wavingly downwards, like ſo many plumes of feathers. Theſe branches when full grown, are 20 feet long, more or leſs; and are thickly ſet on the trunk alternately, riſing gradually ſuperior one to another. As there are many thouſand leaves upon one tree: every branch bearing many ſcores upon it; and every leaf being ſet at a ſmall and equal diſtance from one another, the beauty of ſuch a regular lofty group of waving foliage, ſuſceptible of motion, by the moſt gentle gale of wind, is not to be deſcribed. The middle rib, in each leaf, is ſtrong and prominent, ſupporting it on the under ſide, the upper appearing ſmooth and ſhining. The pithy part of the leaf being ſcraped off, the inſide texture appears to be ſo many longitudinal threads like filaments. Theſe, being ſpun in the ſame manner as they do hemp, or flax, are uſed in making cordage of every kind, as well as fiſhing nets, which are eſteemed ſtronger than thoſe uſually made from any other material of the like nature. Upon removing the large leaves, or branches, which ſurround the top of the trunk, a little way above the beginning of the green bark juſt mentioned, what is called the *cabbage*, is diſcovered lying in many thin, ſnow white, brittle flakes, in taſte reſembling an almond, but ſweeter. This ſubſtance, which cannot be procured without deſtroying the tree, is boiled and eaten with mutton by the inhabitants of the Weſt Indies, in the ſame manner as turnips and cabbage are with us; though it muſt appear the height of extravagancy and luxury to fell ſo ſtately a tree, which would be an ornament to the moſt magnificent palace in the world, to gratify the taſte of any epicure, eſpecially as there is but a very ſmall part of it eatable. What is called the *cabbage flower*, grows from that part of the tree where the aſh coloured trunk joins the green part already deſcribed. Its firſt appearance is a green huſky ſpatha, growing to above 20 inches long, and about four broad; the inſide being full of ſmall white ſtringy filaments, full of alternate protuberant knobs, the ſmalleſt of theſe reſembling a fringe of coarſe white thread knotted: theſe are very numerous, and take their riſe from larger footſtalks; and theſe footſtalks likewiſe are all united to different parts of the large parent ſtalk of all. As this huſky ſpatha is opened while thus young, the farinaceous yellow ſeed in embryo, reſembling fine ſaw duſt, is very plentifully diſperſed among theſe ſtringy filaments, which anſwer the uſe of apices in other more regular flowers: theſe filaments being cleared of this duſt, are pickled, and eſteemed among the beſt pickles either in the Weſt Indies or in Europe. But if this ſpatha is not cut down and opened whilſt thus young; if it be ſuffered to continue on the tree, till it grows ripe and burſts; then the incloſed part, which whilſt young and tender is fit for pickling, will by that time have acquired an additional hardneſs, become ſoon after ligneous, grow buſhy, conſiſting of very many ſmall leaves, and in time produce a great number of ſmall oval thin ſhelled nuts, about the bigneſs of unhuſked coffee berries: Theſe being planted, produce young cabbage trees. The ſockets or grooves, formed by the broad part of the footſtalks of the branches, are uſed by the negroes as cradles for their children. On the inner ſide of the very young footſtalks are tender pellicles, which when dried, it is ſaid, make a writing paper. The trunks ſerve as gutterings; the pith makes a ſort of ſago; and the nuts yield oil by decoction. In the pith alſo, after the trees are felled, there breeds a kind of worms, or grubs, which are eaten and eſteemed a great delicacy by the French of Martinico, St. Domingo, and the adjacent iſlands. Theſe worms, ſays Father Labat, are about two inches long, and of the thickneſs of ones finger; the head is black, and attached to the body, without any diſtinction of neck. Their preparation for the table is as follows: They are ſtrung on wooden ſkewers before a fire; and as ſoon as heated, are rubbed over with raſpings of cruſt, ſalt, pepper, and nutmeg: this powder abſorbs all the fat, which during the cookery would otherwiſe eſcape; when properly roaſted, they are ſerved up with orange and citron ſauce. Theſe worms being expoſed for ſome time to

[illegible] that extremes produce the same effect, they thought the republic had as much to fear from the [illegible] of wealth as from the gripe of poverty. Hence they exacted a minute account of the affairs of every citizen. Hence their great ſeverity to thoſe idle citizens, who, inſtead of being uſeful members in a ſtate, are its bane and its diſhonour. He then draws a moſt beautiful and ſtriking picture of thoſe venerable and aſtoniſhing men, and the order and harmony which flouriſh in Athens by their wiſe adminiſtration. The judges of the Areopagus, ſays our author, were more induſtrious to prevent crimes, by repreſenting them in an odious light, than to eſtabliſh modes of puniſhment. It was their opinion, that the enemies of the ſtate were the inſtruments deſtined by the gods to puniſh

[illegible] The moſt important qualifications [illegible] into the Areopagus. Solon [illegible] who had not been archons [illegible] members of the Areopagus. [illegible] This was [illegible] magiſtrates, after having given [illegible] were [illegible] on their adminiſtration. If [illegible] was found irreproachable, they were admitted [illegible] but the ſmalleſt miſconduct [illegible] from that honour for ever. What adminiſtration [illegible] be expected from a tribunal ſo well compoſed! [illegible] ration was not due to men of ſuch rare talents [illegible] Such reſpect was paid them, that people [illegible] laugh in their preſence: and ſo well eſtabliſhed [illegible] putation for equity, that thoſe whom they [illegible] diſmiſſed without granting their petition, [illegible] that they had been unjuſtly treated. [illegible] St. Paul was called to give an account of his [illegible] converted Dionyſius one of their number. The [illegible] court is as obſcure as its origin, which was [illegible] very remote antiquity. It exiſted, with the other magiſtraties, in the time of Pauſanius, *i. e.* in the ſecond century. The term of its ſubſequent duration is not aſcertained: but a writer, who lived under the emperors Theodoſius the Elder and Younger, in the fifth century, mentions it as extinct.

AREQUIBA, or Arequipa, one of the moſt beautiful cities in all Peru, ſituated in the valley of Quilca, about 20 ues from the ſea, with which it communicates by a fine er. The entrance into the harbour is rather ſhallow for s of great burden; but when once they are entered, they y ride ſecurely in 18 fathoms water. The houſes are t of ſtone, and vaulted; and, contrary to what is uſual warm countries, they are lofty, neatly furniſhed within, finely decorated on the outſide. The inhabitants alſo are exempt from many diſeaſes common in other parts of Peru; which perhaps is owing to their keeping the ſtreets clean by means of canals which extend to the river. The temperature of the air is very good; and though ſometimes a ſlight froſt is perceivable, the cold is never exceſſive, nor heat troubleſome, ſo that the ſurrounding fields are thed with perpetual verdure. Theſe natural advantages vever, are conſiderably allayed by its being very ſubject earthquakes. It is ſituated 220 miles S. E. of Lima, on ſame meridian as Philadelphia, and in 16. 40. S. Lat.

ARETOLOGY, *n. s.* that part of moral philoſophy which ats of virtue, its nature, and the means of arriving at it.

ARGENT, in heraldry, ſignifies the white colour uſed coats of arms. The word is French, derived from the n *argentum*, ſilver; this colour being ſuppoſed the retation of that metal.

RGIL, *n. s.* potter's clay; a fat ſoft kind of earth of ch veſſels are made.

RGILLACEOUS, *adj.* clayey; conſiſting of argil, or tter's clay.

ARGILLOUS, *adj.* conſiſting of clay; clayiſh.

ARGO, or Argo Navis, in aſtronomy, the *Ship Argo*, a conſtellation in the ſouthern hemiſphere, whoſe ſtars, Ptolemy's catalogue, are 45; in Tycho's, 11; in the tannic catalogue; and Sharp's appendix, 64.

ARGONAUTA, the name of a ſpecies of ſhell-fiſh, beng to the order of vermes teſtacea. The ſhell conſiſts ne ſpiral involuted valve. There are two ſpecies, viz.

1. The Argo, with a ſubdented carina, is found in the diterranean and Indian oceans. This is the famous utilus of authors. The ſhell ſeems no thicker nor ſtronger a piece of paper; and the fiſh that inhabits it is a ſe- It has been imagined that men firſt learned the med of ſailing in veſſels from what they ſaw practiſed by creature. When it is to ſail, it extends two of its arms gh; and between theſe ſupports a membrane, which it ws out on this occaſion: this ſerves for its ſail; and the arms it hangs out of the ſhell, to ſerve occaſionally as oars or as a ſteerage; but this laſt office is geneerved by the tail. When the ſea is calm, it is como ſee numbers of theſe creatures diverting themſelves ſailing about in this manner; but as ſoon as a ſtorm or any thing gives them diſturbance, they draw in legs, and take in as much water as makes them ſomeavier than the ſea-water in which they ſwim, and then ſink to the bottom. The manner of their voidhis abundant water, when they would riſe again, is by a number of holes, of which their legs are full. Plate X.

2. The Cymbium, which has a blunt plaited carina. This ſpecies is very ſmall, and is found in the Mediterranean.

ARGOS, a town of the Morea, in ancient Greece, ſituated at the entrance of the river Inachus. It was formerly a place of great ſplendor, but is now almoſt entirely ruined. It lies 25 miles S. of Corinth. Long. 98. 5. E. Lat. 37. 30. N.

To ARGUE, *v. a.* 1. To prove any thing by argument. —2. To debate any queſtion.—3. To prove, as an argument.—4. To charge with, as a crime.

To Argue, *v. n.* 1 To reaſon; to offer reaſons.—2. To perſuade by argument.—3. To diſpute.

ARGUER, *n. s.* a reaſoner; a diſputer.

ARGUMENT, *n. s.* 1. A reaſon alledged for or againſt any thing.—2. The ſubject of any diſcourſe or writing.—3. The contents of any work ſummed up by way of abſtract. —4. A controverſy.

Argument, in logic and rhetoric, an inference drawn from premiſes, the truth of which is indiſputable, or at leaſt highly probable. See Logic.

ARGUMENTAL, *adj.* belonging to argument; reaſoning.

ARGUMENTATION, *n. s.* reaſoning; the act of reaſoning.

ARGUMENTATIVE, *adj.* conſiſting of argument; containing argument. Argumentum *ad* hominem, is to preſs a man with conſequences, drawn from his own principles and conceſſions.

ARGUTE, *adj.* 1. Subtle; witty; ſharp.—2. Shrill.

ARIANISM, the doctrine of Arius, who lived in the beginning of the fourth century. See Arians and Unitarians.

ARIANS, followers of Arius, a preſbyter of the church of Alexandria about A. D. 315; who maintained, that the Son of God was totally and eſſentially diſtinct from the Father; that he was the firſt and nobleſt of thoſe beings whom God had created, the inſtrument by whoſe ſubordinate operation he formed the univerſe; and therefore inferior to the Father both in nature and dignity: alſo, that the Holy Ghoſt was not God, but created by the power of the Son. The Arians owned that the Son was the Word, but denied that Word to have been eternal. They held, that Chriſt had nothing of man in him but the fleſh, to which the *logos*, or Word was joined, which was the ſame as the ſoul in us.

The Arians were firſt condemned and anathematized by a council at Alexandria in 320, under Alexander, biſhop of that city; who accuſed Arius of impiety, and cauſed him to be expelled from the communion of the church: and afterwards by 380 fathers in the general council of Nice, aſſembled by Conſtantine in 325. The doctrine, however, was not extinguiſhed; on the contrary, it became the reigning religion, eſpecially in the Eaſt, where it obtained much more than in the Weſt. Arius was recalled from baniſhment by Conſtantine in two or three years after the council of Nice, and the laws that had been enacted againſt him were repealed. In 335, Athanaſius, his zealous opponent, was depoſed and baniſhed into Gaul, and Arius and his followers were reinſtated in their privileges, and received into the communion of the church. In a little more than a year after this, he fell a victim to the reſentment of his enemies, and died a tragical death, probably occaſioned by poiſon. The Arians found a protector in Conſtantius, who ſucceeded his father in the Eaſt; and the zeal with which he abetted them produced many animoſities and tumults to the time of his death in 362. They underwent various revolutions, perſecutions and oppreſſions, under ſucceeding emperors, according to the degree of intereſt they had in the civil power, till at length Theodoſius the Great exerted every poſſible effort to ſuppreſs and diſperſe them. Their doctrine was carried in the fifth century into Africa under the Vandals; and into Aſia under the Goths. Italy, Gaul, and Spain, were alſo deeply infected with it; and towards the commencement of the ſixth century, it was triumphant in many parts of Aſia, Africa, and Europe. But it ſunk almoſt all at once, when the Vandals were driven out of Africa, and the Goths out of Italy, by the arms of Juſtinian. However, it revived again in Italy under the protection of the Lombards in the ſeventh century.' Eraſmus ſeems to have aimed in ſome meaſure to reſtore Arianiſm at the beginning of the 16th century, in his Commentaries on the New Teſtament. Accordingly, he was reproached by his adverſaries with Arian interpretations and gloſſes, Arian tenets, &c. To which he made little anſwer, ſave that there was no hereſy more thoroughly extinct than that of the Arians. But the face of things was ſoon changed. Servetus, a Spaniard by nation, publiſhed, in 1531, a little treatiſe againſt the Trinity, which once more revived the opinions of the Arians in the Weſt. Indeed he rather ſhowed himſelf a Photinian than an Arian; only that he made uſe of the ſame paſſages of Scripture, and the ſame arguments againſt the Saviour, with the proper Arians. Servetus had not, properly ſpeaking, any diſciples; but he gave occaſion after his death to the forming of a new ſyſtem of Arianiſm in Geneva, much more ſubtle and artful than his own, and which not a little perplexed Calvin. From Geneva the new Arians removed to Poland, where they gained conſiderable ground; but at length became Socinians. The appellation *Arian* has been indiſcriminately applied, in more modern times, to all thoſe who conſider Jeſus Chriſt as inferior and ſubordinate to the Father, and whoſe ſentiments cannot be ſuppoſed to coincide exactly with thoſe of the ancient Arians. Mr. Whiſton was one of the firſt divines who revived this controverſy, in the beginning of the 18th century. He was followed by Dr. Clarke, who publiſhed his famous book entitled *The Scripture Doctrine of the Trinity*, &c. In conſequence of which, he was reproached with the title of *Semi-Arian*. He was alſo threatened by the convocation and combated by argument. Dr. Waterland, who has been charged with verging towards Tritheiſm, was one of his principal adverſaries. The hiſtory of this controverſy during the laſt century may be found in a pamphlet, entitled "An account of all the conſiderable Books and Pamphlets that have been wrote on either ſide, in the Controverſy concerning the Trinity, from the year 1712, to the end of 1718."

ARID, *adj.* dry; parched up.

ARIDITY, *n. s.* 1. Dryneſs; ſiccity.—2. A kind of inſenſibility in devotion.

ARIES, *n. s.* the ram; one of the twelve ſigns of the zodiac; the vernal ſign.

ARIES, in zoology. See OVIS.

To ARIETATE, *v. n.* 1. To butt like a ram.—2. The act of battering with an engine called a ram.—3. The act of ſtriking, or conflicting in general.

ARIETTA, *n. s.* a ſhort air, ſong, or tune.

ARIGHT, *adv.* 1. Rightly; without mental error.—2. Rightly; without crime.—3. Rightly; without failing of the end deſigned.

ARIOLATION, or HARIOLATION, *n. s.* foothſaying.

ARIOSO, *n. s.* the movement of a common air, ſong, or tune.

To ARISE, *v. n.* pret. *aroſe*, part. *ariſen*. 1. To mount upwards as the ſun.—2. To get up as from ſleep, or from reſt.—3. To come into view, as from obſcurity.—4. To revive from death.—5. To proceed or have its original.—6. To enter upon a new ſtation.—7. To commence hoſtility.

ARISTOCRACY, *n. s.* that form of government which places the ſupreme power in the nobles, without a king, and excluſively of the people. Ariſtocracy is often uſed for the nobility of a country, under a monarchy or any form of government. Ariſtocracy ſeems to coincide with OLIGARCHY; which, however, is more ordinarily uſed to ſignify a corruption of an ariſtocratical ſtate, where the adminiſtration is in the hands of too few, or where ſome one or two uſurp the whole power.

ARISTOCRAT, or ARISTOCRATE, a nobleman; a member of the ariſtocracy.

ARISTOCRATICAL, ARISTOCRATIC, *adj.* relating to aſtocracy; including a form of government by the nobles.

ARISTOLOCHIA, BIRTHWORT: A genus of the hexandria order, belonging to the gynandria claſs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. It has no calyx; the corolla conſiſts of one entire petal; and the capſule, which is below the flower, has ſix cells. The ſpecies are 21; but only the four following merits deſcription.

1. The CLEMATITIS, has heart-ſhaped leaves, an upright ſtem, and the flowers crowded in the axillæ. The root is long and ſlender.

2. The INDICA, or contrayerva of Jamaica, is a native of that iſland, where its roots are uſed inſtead of the true contrayerva. It hath long trailing branches, which climb upon the neighbouring plants, and ſometimes riſe to a conſiderable height. The flowers are produced in ſmall cluſters towards the upper part of ſtalks, which are of a dark purple colour.

3. The LONGA is a native of France, Spain, and Italy. It has long ſap-roots like carrots; the branches are weak and trailing, extending little more than a foot; the flowers come out from the wings of the leaves, and are of a pale purple colour.

4. The ROTUNDA, is alſo a native of the S. of France, Spain, and Italy, from whence the roots are brought for medical uſe. The roots are roundiſh, grow to the ſize of ſmall turnips being in ſhape and colour like the roots of cyclamens, and are frequently ſold inſtead of them. This ſort hath three or four weak trailing branches, which lie on the ground when they are not ſupported, and extend two feet in length; the leaves are heart-ſhaped and round at their extremity; the flowers come out ſingly at every leaf, toward the upper part of the ſtalk. They are of a purpliſh black colour.

ARISTOTELIAN PHILOSOPHY, the philoſophy taught by Ariſtotle, and maintained by his followers.

ARISTOTELIANS, a ſect of philoſophers, called alſo *Peripatetics*. The Ariſtotelians and their dogmata prevailed long in the ſchools and univerſities; even in ſpite of all the efforts of the Carteſians, Newtonians, and other corpuſculians. But the ſyſtems of the latter have at length gained the pre-eminence; and the Newtonian philoſophy in particular, is now generally received. The principles of Ariſtotle's philoſophy, the learned agree, are chiefly laid down in his four books *De Cœlo;* his eight books of *Phyſical Auſcultation*, belonging rather to logics, or metaphyſics, than to phyſics. Inſtead of the more ancient ſyſtems, he introduced matter, and form, and privation, as the principles of all things; but he does not ſeem to have derived much benefit from them in natural philoſophy. His doctrines are, for the moſt part, ſo obſcurely expreſſed, that it has not yet been ſatisfactorily aſcertained, what were his ſentiments on ſome of the moſt important ſubjects. He attempted to refute the Pythagoræan doctrine concerning the twofold motion of the earth; and pretended to demonſtrate, that the matter of the heavens is ungenerated, incorruptible, and ſubject to no alteration: and he ſuppoſed that the ſtars were carried round the earth in ſolid orbs. The reader will find a diſtinct account of the logical part of his philoſophy, by Dr. Reid, profeſſor of moral philoſophy, in the Univerſity of Glaſgow, in Lord Kames's Sketches of the Hiſtory of Man, vol. II. and Mr. Harris has publiſhed a ſenſible commentary on his Categories, under the title of *Philoſophical Arrangements*.

ARISTOELICA ROTA. See ROTA.

ARITHMETIC.

ARITHMETIC, from the Greek *Arithmetike*, is the art of numbering, or the art of computing by numbers.

When a number is made up or compoſed of intire units, or individuals, it is called a *whole* number. That which is not ſo compoſed, but contains part of a unit, is named a *fractional* number. When an unit contains ten, an hundred, a thouſand, ten thouſand, &c. of ſuch parts, they are termed *decimal* parts; and the arithmetic of numbers in which they occur, is called *decimal arithmetic*. When twelve of the parts make an unit, they are ſtiled *duodecimal* parts; and the arithmetic thereof is named *duodecimal arithmetic*.

If ſixty of the parts go to an unit, they are called *sexagesimal* parts, and the proper management thereof in computations, is termed *sexageſimal arithmetic*.

In general, every other kind of arithmetic is named *common* or *vulgar arithmetic*, except ſpecious or univerſal arithmetic, for which ſee ALGEBRA.

That arithmetic was practiſed very early in the world, is beyond a doubt, for the idea of number is conveyed from every thing about us; but when, or by whom it was firſt taught, there is no certain records. The Moſaic account of the antediluvian world affords a ſtrong preſumption that the art of numbering had arrived to a tolerable degree of perfection before the flood. For their dividing the year into months and days, ſo little differing from the preſent diviſion of time, together with their ſtrict chronology of events, ſuch as the beginning, progreſs, and end of the flood; the births and ages of the patriarchs, &c. all argue their knowledge of numbers: wherefore I cannot ſuppoſe, as ſome do, that the art had its riſe among the Phœnicians, who are reputed to have been the firſt merchants after the flood; though I doubt not but they cultivated and improved it: and, it is probable, that by them it was carried into Egypt, and that it paſſed from thence into Greece.

In order to render arithmetical computations uſeful to ſociety, the firſt thing would be to eſtabliſh ſome common method of notation, on which computations might be founded. It would then be natural to enquire into the relations and properties of numbers, and to invent methods of operation.

The Greeks, Hebrews, and other eaſtern nations, in their notations, uſed the letters of the alphabet; but their methods were confined and very incommodious, which rendered their computations exceedingly difficult and laborious; as is obſervable from the ſpecimens in ſome of the fragments of Pappus, and the Commentaries of Utocius on on Archimedes' Treatiſe of the Circle.

The method of notation now in uſe with us, is ſaid to have been received from the Arabians, who learnt it to the Indians. The time of its invention is unknown: but that neither the ancient Greeks nor Romans were acquainted with it, is almoſt certain. Maximus Planudes, who wrote about the beginning of the 14th century, is the firſt Greek writer who has treated of arithmetic according to the preſent mode of numbering, which was at leaſt three hundred years after it was known in Europe; for Doctor Wallis has clearly evinced that a monk named Gerberus, (afterwards Pope Sylveſter II.) who died A. D. 1003, was well acquainted with our notation; having learned it in Spain, from whence he carried it into France many years before his death.

It is reported that it came into Spain by means of the Moors; and it is almoſt certain that it was in uſe in England as early as the middle of the 12th century. There is a book extant of Joannes de Sacra Boſco, which was written in England about the middle of the 13th century, according to the preſent notation; and conſiderable improvements had been made there in this kind of computations before them.

The oldeſt treatiſe on the theory of arithmetic is compriſed in the 7th, 8th, and 9th books of Euclid's Elements. It relates chiefly to the doctrine of proportion, and prime and compoſite numbers. The next is that of Nichomacus, the Pythagorean: his treatiſe conſiſts chiefly of the diviſion of numbers into certain kinds and claſſes, as plain, ſolid, triangular, quadrangular, and other ſpecies of figurate numbers: alſo numbers odd and even, &c. Some are of opinion that Nichomacus lived before Euclid.

Boethus, who wrote a Latin treatiſe on arithmetic in the time of Theodorick the Goth, is the next remarkable author on this ſubject: he, however, it is ſuppoſed, took moſt of his works from Nichomacus. Afterwards Pſellus, and Jodochus Willichius, wrote in Greek, but none of theſe were acquainted with the Arabian notation. The firſt author of any conſequence who uſed the modern way of computing, was Jordanus of Namur. He flouriſhed about A. D. 1200; and his arithmetic was afterwards publiſhed and demonſtrated by Joannes Faber Stapulenſis in the 15th century, who alſo himſelf publiſhed a treatiſe containining moſt of the propoſitions of Euclid and Boethus, with many other curious and uſeful theorems. The ſame author alſo wrote a book under the title of Algoriſmus Demonſtratus, illuſtrating the new art of computation by Arabic figures, the manuſcript of which, as Doctor Wallis informs us, is in the Savillian library at Oxford.

Lucas de Burgo, an Italian, publiſhed, A. D. 1499, a valuable treatiſe on arithmetic, both as to theory and practice. Alſo in the courſe of the folloing century, Nicholas Tartaglia, an Italian; Clavius and Ramus, both Frenchmen; Stifelius and Heniſchius, Germans; Buckley, Diggs, and Record, Engliſhmen; employed themſelves in improving the art. Theſe have been followed by Wingate, Tacquet, Moor, Parſon, Baker, Kerſey, Wells, Knocker, Fiſher, Emerſon, Hutton, Bonnycaſtle, and a variety of other authors too tedious to mention; indeed authors on this ſubject are become almoſt innumerable.

Having given a ſhort hiſtorical account of arithmetic, we ſhall proceed to ſhew its operations.

CHAPTER I.

NOTATION.

I. Notation is the art of expreſſing properly and methodically any propoſed number in figures or characters.

II. Number is the name of that idea or notion, under which, things, being conſidered, are ſaid to be *one* or *many*.

III. Every number is expreſſible by the due ordering of the following figures; viz. 1, which, of itſelf, ſignifies one, or an unit; 2, which denotes two; 3, three; 4, four; 5, five; 6, ſix; 7, ſeven; 8, eight; 9, nine; 0, nothing.

IV. A whole number is compoſod of entire units.

V. A fractional number is either only ſome part or parts of an unit, or it is compoſed both of entire units, and of ſome part or parts of an unit. In the former caſe, it is named a proper fraction; in the latter, it is called a mixed number.

VI. A whole number is alſo of two ſorts, ſimple and compound. A ſimple whole number conſiſts either of entire units, tens, hundreds, thouſands, &c. not exceeding nine: a compound whole number conſiſts not of either units, tens, hundreds, thouſands, &c. alone, but of ſome two or more of theſe combined: For inſtance, ten, twenty, (or two tens) fifty, (or five tens) one hundred, three hundred, five thouſand, &c. are ſimple whole numbers: and twelve, (or ten and two,) twenty-four, (or twenty and four) an hundred and forty-five, three thouſand two hundred and ſixty, &c. are compound whole numbers.

VII. As all units (under ten) are expreſſed by the nine digits, 1, 2, 3, 4, 5, 6, 7, 8, 9; ſo all ſimple whole numbers of tens, hundreds, thouſands, &c. are expreſſed by the ſame figures with cyphers annexed; tens having one cypher annexed; hundreds, two; thouſands, three, &c. Thus 10 ſignifies ten; 20, twenty; 30, thirty; 40, forty; 300, three hundred; 5000, five thouſand, &c.

Cor. Hence, a cypher, though of itſelf, or when alone, ſignifies nothing, yet, when placed to the right of any figure, it increaſes its value tenfold.

VIII. As compound whole numbers conſiſt of different ſimple whole numbers combined together, ſo ſuch numbers are expreſſed by the combining or joining together the ſeveral figures denoting them. Thus twenty-five conſiſts of 20 and 5; the cypher in the former denoting that there are no units, and ſignifies 20 without any addition; but, putting the five in the cypher's place, we have 25, which is the true expreſſion for twenty-five. Again, three hundred and ſixty-four, conſiſts of 300, 60, and 4; but joining theſe together, 60 and 4 make 64, and joining this to 300, the whole is 364. Furthermore, eight thouſand, four hundred and ſeventy-five, conſiſts of 8000, 400, 70, and 5; and 70 and 5 make 75; alſo 75 and 400 make 475; and 475 and 8000 make 8475, the propoſed number; and ſo for others.

Cor. I. Hence, the firſt place towards the right hand of and whole number, conſiſts of units; the ſecond, of tens; the third, of hundreds; the fourth, of thouſands, &c. the value of any figure being increaſed or decreaſed, according as its ſtation is removed one place more to the left or right hand.

Cor. II. Hence, by this management, any number, however great, is eaſily and readily expreſſed.

The following table denotes the value of any number, to the hundred thouſand of millions.

Hundreds of Thouſands of Millions.	Tens of Thouſands of Millions.	Thouſands of Millions.	Hundreds of Millions.	Tens of Millions.	Millions.	Hundreds of Thouſands.	Tens of Thouſands.	Thouſands.	Hundreds.	Tens.	Units.
4	5	6,	9	8	7,	5	6	2,	3	4	1

In this table, the firſt figure to the right, taken ſingly, denotes 1; if two are taken, they make 41; three make three hundred and forty-one; four two thouſand, three hundred and forty-one; five, ſixty-two thouſand, three hundred and forty-one; ſix, five hundred and ſixty-two thouſand, three hundred and forty one; ſeven, ſeven millions, five hundred and ſixty-two thouſand, three hundred and forty-one; eight, eighty-ſeven millions, five hundred, &c. &c. as before; nine, nine hundred and eighty-ſeven millions, five hundred, &c. &c. ten, ſix thouſand, nine hundred and eighty-ſeven millions, &c. &c. eleven, fifty-ſix thouſand, nine hundred and eighty-ſeven millions, &c. &c. twelve, four hundred and fifty-ſix thouſand, nine hundred and eighty-ſeven millions, &c. &c. After this manner any other numbers, let the figures be what they may, are to be read.

Thus, 678075302, ſignifies ſix hundred and ſeventy-eight millions, ſeventy-five thouſand, three hundred and two; alſo, 20367540213, ſignifies twenty thouſand, three hundred and ſixty-ſeven millions, five hundred and forty thouſand, two hundred and thirteen.

N. B. It will be uſeful, in reading large numbers, to point them off at every three figures, as every three are run off together in the reading. Thus, in the laſt example, the firſt three are taken together, the next three are read in like manner, only the word thouſands is added; the next three are diſtinguiſhed by the word millions following in the reading. If there were three more, they would ſtill be read the ſame way, only the word thouſands would again follow; after the next three, millions of millions, (by ſome termed billions;) after the next three, thouſands again; after the next, millions of millions of millions, (or trillions,) and ſo on; the word thouſand, and the repetition of millions of millions of millions of millions, &c. or quadrillions, quintillions, &c. according to the value, following each other alternately in the reading.

The following is a Synopſis of the Roman Notation, by Letters in the Alphabet.

1	is denominated by	I	50 = L
2	by	II	100 = C
3		III	500 = D or IↃ
4		IIII or IV	1000 = M or CIↃ
5		V	2000 = MM
6		VI	5000 = IↃↃ or $\overline{\text{V}}$
7		VII	6000 = $\overline{\text{VI}}$
8		VIII	10000 = $\overline{\text{X}}$ or CCIↃↃ
9		IX	50000 = IↃↃↃ
10		X	60000 = $\overline{\text{LX}}$
11		XI	100000 = $\overline{\text{C}}$ or CCCIↃↃↃ
12		XII	500000 = IↃↃↃↃ
13		XIII	1000000 = $\overline{\text{M}}$ or CCCCIↃↃↃↃ
14		XIV	2000000 = $\overline{\text{MM}}$
15		XV	5000000 = IↃↃↃↃↃ or $\overline{\text{IↃↃ}}$
16		XVI	10000000 = $\overline{\text{CCIↃↃ}}$
17		XVII	50000000 = $\overline{\text{IↃↃↃ}}$
18		XVIII	&c. &c.
19		XIX	
20		XX	

Remarks on this Notation.

1ſt. As often as any character is repeated, ſo many times its value is repeated.

2d. A character of inferior value, with reſpect to another character, does, when placed before the ſame, diminiſh its value by the value of ſuch inferior character; but, if placed after it, the value thereof is ſo much increaſed.

3d. Every Ↄ affixed to this character IↃ (500) increaſes its value ten-fold.

4th. Every time a C and Ↄ are placed at each end of this character, CIↃ (1000) its value is increaſed ten-fold.

5th. A line over any character increaſes its value a thouſand fold.

By a ſlight compariſon of the two notations, it is obvious how much ſuperior the preſent mode of numbering is to the old Roman method; both as being more ſimple and eaſy, and infinitely better accommodated to arithmetical operations.

Characters or Signs made uſe of in this Syſtem.

1ſt. This character (+) ſignifies plus, or more, placed between two numbers, it denotes that they are to be added together.

2d. This ſign (—) ſignifies minus, or leſs, and put between two numbers, ſhews that the latter is to be ſubtracted from the former.

3d. When this mark (×) is put between two numbers, it ſignifies that they are to be multiplied together.

4th. This character (÷) being put between two numbers, denotes that the former muſt be divided by the latter.

Note alſo, if two numbers be placed one above another, with a line between them, it ſignifies that the upper number is to be divided by the under one.

5th. This character (=) placed between two numbers, denotes them to be equal. Thus $4 + 5 = 9$, ſignifies that the ſum of 4 and 5 is equal to 9.

6th. A figure of 2 put over any number, denotes the ſquare thereof; a figure of 3, the cube thereof; a figure of 4, the biquadrate thereof, &c. Thus 4^2, 4^3, 4^4, denote the ſquare, cube, and biquadrate of 4 reſpectively.

7th. This ſign ($\surd$) prefixed to any number, ſignifies that the ſquare root thereof is to be extracted; and if a 3, 4, 5, &c. be put over this character, it ſhews that the cube, biquadrate, ſur-ſolid, &c. root is to be extracted. Thus $\surd 64$, $\sqrt[3]{}64$, $\sqrt[4]{}64$, denote the ſquare root, the cube root, and the biquadrate root of 64.

8th. When two points (:) are placed between two numbers, and four points (: :) between the next two, it indicates that theſe numbers are proportional. Thus 2 : 4 : : 6 : 12, muſt be read thus: As 2 is to 4 ſo is 6 to 12.

9th. A line or vinculum (——) drawn over the top of numbers, ſhews that they are to be taken as one compound quantity.

CHAPTER II.

RUDIMENTS OF SIMPLE ARITHMETIC, OR THE ARITHMETIC OF WHOLE NUMBERS.

Sect. I. Addition *of* Whole Numbers.

Addition is the method of collecting certain given numbers into one, which ſhall be equivalent to the whole.

Axiom. The whole, is equal to all its parts taken together. Hence this

Rule. Place all the numbers one under another, in ſuch order that the units place of each may exhibit one diſtinct row; the tens place of each, another diſtinct row; the hundreds place, another; the thouſands, another, &c. drawing a line underneath the whole. Then begin at the unit's place, and reckon up all the figures in that row, writing down the overplus, above entire tens, under the line, and bearing in mind ſo many to be carried and added to the next row, as there are tens in the firſt. Then the row of tens being accordingly added up, together with what was carried, the overplus which remains above entire tens, muſt be put down below the line, under the ten's place, and one for each ten muſt be carried to the next row, and the proceſs continued in this manner through each column, obſerving to write, under the laſt row, the whole ſum.

N. When there is no exceſs above the tens, write a column.

EXAMPLES.

3278	78426	40325
4152	54315	1072
673	67820	128
4028	47853	54320
7068	69542	7809
3254	57869	3456
782	34578	876
4630	78456	327
2043	47807	48728
Sum 29908	Sum 536666	Sum 157041

Here, in the firſt example, having placed the ſeveral ſums, one below another, and drawn a line under them, as directed above; I begin with the unit's column, ſaying 3 and 2 are 5, and 4 make 9, and 8, 17; and 8, 25; and 3, 28; and 2, 30; and 8, 38. Set down the overplus 8, and carry 3 for the three tens to the next column, which, on caſting up, I find amounts to 50; wherefore, as there is no overplus above the tens, I ſet down 0, and carry 5 to the next row, which I add up in like manner, and find it amounts to 29; I therefore ſet down 9, and carry 2 to the laſt row, the amount of which I find is 29908. Obſerve the ſame method in the other examples.

N. B. Addition is proved by beginning at the top and caſting each row downwards.

SECT. II. SUBTRACTION *of* WHOLE NUMBERS.

SUBTRACTION is the taking of one number from another, in order to find their difference.

RULE. Place the greateſt number uppermoſt, ſo that units may be under units, tens under tens, &c. and draw a line under them. Then begin at the unit's place, and take the lower figure from the upper figure, placing down the difference underneath them; and do ſo with the reſt of the figures. But if the lower figure in any inſtance be greater than the upper figure, then 10 muſt be added to the upper figure, and, ſubtraction being made, 1 muſt be carried to the next lower figure, and the ſum muſt be ſubtracted from the figure which is above the ſame, placing down the remainder, and proceeding agreeably to theſe directions with each row.

EXAMPLES.

From 4286	From 478023	From 678092
Take 3242	Take 67842	Take 589764
Remaind. 1044	Remaind. 410181	Remaind. 88328

Here, in the firſt example, the numbers being properly placed, and a line drawn as directed, I proceed thus: take 2 from 6 and there reſts 4, which I put down; then I ſay, take 4 from 8 and there reſts 4; take 2 from 2 and there reſts 0: and take 3 from 4 and there remains 1; each of which remainders I write down under its proper figure, and the whole is 1044.

In the ſecond example, I ſay 2 from 3 and there reſts 1; 4 from 2 I cannot take, but borrowing 10 to put to it, it becomes 12, from which taking 4, the remainder is 8; then I carry 1 to 8, and it becomes 9; and as 9 cannot be ſubtracted from 0, I again borrow 10, and the remainder is 1; then I carry 1 to 7, and ſo ſubtracting, the remainder is 0. Alſo, 6 from 7, and there reſts 1, and nothing from 4 leaves 4; therefore the whole remainder is 410181; and ſo for any other.

N. B. Subtraction is proved by adding the remainder and the under line, or number ſubtracted, together; for, if their ſum be equal to the upper line, the work is right; otherwiſe not.

SECT. III. MULTIPLICATION *of* WHOLE NUMBERS.

Multiplication is a compendious method of performing a manifold addition of the ſame number. But before any thing can be done, the following table muſt be perfectly got by heart.

MULTIPLICATION TABLE.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

Explanation of the Table.

To find the product of two figures, look for one of the figures in the top row, and the other in the ſide row; the figure in the angle of meeting is their product.

Thus, the product of 5 and 2 is 10, and of 6 and 9 is 54.

General Rule for Multiplication.

Place the multiplier (or number given to multiply by) under the multiplicand, (or the number to be multiplied) ſo that units may be under units, tens under tens, &c. and draw a line under them. Then begin with the unit's figure of the multiplier, (if it conſiſts of more than one) and by it multiply the units figure of the multiplicand. Set down the overplus above the tens, below the line, in the unit's place, and for each ten bear in mind 1 to be added to the next product. Then, by the ſame figure, multiply the next figure of the multiplicand, adding ſo many units as there were tens in the laſt product, and placing down the overplus as before. Proceed thus till each figure in the multiplicand has been multiplied by the firſt figure in the multiplier, writing down the product of the laſt entire. Then take the ſecond figure of the multiplier, and multiply thereby as with the firſt, placing the firſt figure of the product under the figure which you multiply with. Do ſo with each figure in the multiplier, ſo will the ſum of thoſe products be the product required.

Example I.

Multiply 468352
By 6
Product 2810112

Example II.

Multiply 6084358
By 11
Product 66927938

Example III.

Multiply 84308765
By 243

252926295
337235060
168617530

20487029895

Here, in the firſt example, I multiply the firſt figure of the multiplicand by 6, ſaying 6 times 2 are 12; I ſet down the 2 and carry one; then I proceed to the next figure, and ſay 6 times 5 are 30, and 1 that I carry, make 31; I ſet down 1, and carry 3, ſaying 6 times 3 are 18, and 3 make 21. I put down 1, and carry 2; proceeding to the next figure, whoſe product by 6 is 48, and 2 which are carried make 50; ſo I write down 0, and carry 5; then the product of the next figure is 36, and 5 which are carried, make 41; therefore, I place down 1 and carry 4; the laſt product is 24, and 4 which are carried make it 28, which I write down, and ſo the whole product is 2810112.

In like manner the ſecond example is performed.

In the third example, I firſt multiply by 3, the unit's figure of the multiplier, ſetting down the whole product 252926295, as above; then I multiply by 4, placing the firſt figure of the product directly under it, in the ten's place, and the reſt of the figures in the proper order as they follow each other. Laſtly, I multiply by 2, and place the firſt figure of the product under it in the third place, and the reſt in regular order as they come. Then the ſum of the products, caſt up in the order they ſtand, is 20487029895, which is the product required.

Note. The ſecond example might have been done according to the manner of the third, by making two products, 1 being the multiplier each time.

Example IV.

Multiply 42786307
By 218403

128358921
171145228O
342290456
42786307
85572614

Product 9344657807721

Example V.

Multiply 68901478
By 4567318

551211824
68901478
206704434
482310346
413408868
344507390
275605912

Product 314694960696004

Cor. I. When either the multiplicand, multiplier, or both, have cyphers on the right hand, then multiply the ſignificant figures according to the former rule; and annex to the product as many cyphers as there are in the multiplicand and multiplier.

Example. Let 8430876500 be multiplied by 243000.

Here, 84308765 multiplied by 243, the product is 20487029895; to which annexing five cyphers (the number in both the multiplicand and multiplier) it becomes 2048702989500000, which is the product required.

Cor. II. Hence, if the multiplier be 10, 100, 1000, 10000, &c. the product is had by annexing as many cyphers to the multiplicand as there are in the multiplier. Thus the product of 246875 by 10 is 2468750; by 100, it is 24687500; by 1000, it is 246875000, &c.

Cor. III. When the multiplier is a compoſite number, that is a number which conſiſts of complete factors, or in other words, is the product of ſome two or more numbers, then the multiplicand being multiplied by one of the factors, and that product by the other, and ſo on for each factor, the laſt product will be the product anſwering the whole; and by this method the trouble of adding two or more lines may frequently be ſaved.

Example. Let 785364 be multiplied by 48.

Here the number 48 conſiſts of the factors 6 and 8. Wherefore I multiply 785364 by 8, and the product is 6282912, which multiplied by 6, gives 37697472, the anſwer ſought, and ſo the addition of two lines is ſaved.

N. B. It would have been the ſame if the firſt product had been made by 6, and the next by 8; for it is an indifferent thing in whatever order the factors are taken.

Alſo, in any numbers the multiplicand may be made the multiplier, and the multiplier the multiplicand, at pleaſure, according as it ſhall appear to be the moſt advantageous in the operation.

Cor. IV. When the multiplier is any number above 10 and under 20, ſet the product made by the unit figure a place further to the right hand, and add thereto the multiplicand, or the multiplicand may be added by taking a figure at a time, as you proceed on in the operation after you have multiplied the firſt figure in the multiplicand.

Examp. Let 46302 be multiplied by 17. The operation is as below.

Firſt Method.	Second Method.
46302	46302
324114 product by 7.	17
787134 product.	787134 product.

Explanation of the Second Method.

Firſt I multiply the unit's figure of the multiplicand by 7, and ſet down the overplus which is 4; and carry 1; then I multiply the next figure, or cypher, and take in the unit's figure of the multiplicand together with what was carried, and the whole is 3. Then I multiply the next figure which is 3, taking in the figure in the ten's place of the multiplicand; which in this inſtance, being only a cypher, does not augment the product. In like manner, I proceed to the next figure; the product thereby is 42, which, with 2 which was to be carried, and the figure in the hundreds place of the multiplicand, namely 3, makes 47. I ſet down 7 and carry 4, and thus proceed to the end, taking in a figure of the multiplicand each time. This, when it becomes familiar, is exceedingly eaſy, and will ſave the writing of many needleſs figures.

N. B. In the ſame way when the multiplier is above 110, and leſs than 120, the product will be had by taking in the firſt figure of the multiplicand when you come to the ten's place, and the firſt and ſecond when you come to the hundred's place; afterwards the 2d and 3d, the 3d and 4th, and ſo on; till the multiplication is completed.

Cor. V. When the multiplier conſiſts of two figures and the unit's place is 1, multiply by the figure in the ten's place, and at each multiplication take in a figure of the multiplicand. The firſt figure ſo taken in muſt be that in the ten's place, the next that in the hundred's, &c. leaving out the unit's figure, but annexing the ſame to the product on the right, ſo that it may therein obtain the place of units.

Example. Multiply 634 by 21.

Here, in multiplying by 2, I take in 3 the firſt time, which makes the product 11, I ſet down 1 and carry 1, and the next time I take in the 6, which make the product 13; I ſet down 3, and carry 1, and ſo the next product is 13, which I ſet down; and, by annexing the units figure to the number it becomes 13314. the product ſought.

634
21
———
13314

Cor. VI. When the multiplier is 100, 1000, 10000, &c. wanting any number conſiſting of two figures, of which either the firſt or ſecond figure is an unit, then multiply the multiplicand by the number ſo wanting; having previouſly annexed thereto, 2, 3, 4, &c. cyphers, as the caſe ſhall be, and the remainder will be the anſwer.

Thus, let 54327 be multiplied by 988. 'Here, the multiplier is 1000, wanting 12; therefore I multiply 54327, by 12, and the product is 6519324; which ſubtracted from 54327000, leaves 53675076, the anſwer required.

Cor. VIII. When in the multiplier, ſome two or more adjacent figures are equal to ſome multiple of another figure therein, the operation may be abbreviated by multiplying firſt by that other figure, and then by multiplying that product by the figure which denotes the multiple, and adding the two products together, having placed them ſo that the firſt figure of each row or product, may ſtand under that figure of the multiplier, whoſe product by the multiplicand, ſuch row denotes.

Example I.

Multiply 408765
By 3612
———
4905180
14715540
———
Product 1476459180

Example II.

Multiply 4675231
By 324981
———
42077079
378693711
1514774844
———
1519361245611

Explanation.

In the firſt example, I begin with multiplying by 12, and then I multiply that product by 3; becauſe, three times 12 are equal to the next two figures 36. I place the products down as above, and their ſum is the whole product required.

In the ſecond example, the firſt row of figures obtained, is the product by 9, the ſecond is taken equal to 9 times the firſt row; becauſe, 9 times 9, are equal to the firſt two figures (81), and the third row is taken equal to 4 times the ſecond row; becauſe 4 times 81, are equal to the laſt three figures (324).

Their ſum, according to the due order in which they are placed, is 1519361245611, the product required.

In both theſe examples the operations are performed with half the trouble and half the figures, which are required by the common method.

Schol. It will frequently happen that great advantages may be derived from the joint application of theſe ſeveral methods.

Thus. If the multiplier is 12816; the product for the firſt two figures, viz. 16, may be had in one line by Cor. IV. and the product for the laſt three will be had by multiplying that product by 8; becauſe 8 times 16, are equal to 128. And the product, by the whole, will be equal to the ſum of theſe two when placed in due order. This mode of contracting, though not generally met with in arithmetical books, is, notwithſtanding, of great utility; as it will ſeldom happen in the courſe of buſineſs, that ſome advantage will not accrue either from its rendering the operation ſhorter or more eaſy, and very frequently both. A variety of forms of proceeding in different caſes might have been enumerated, but our limits confine us to paſs on to other matters; we are, however, perſuaded that what has been ſhewn, will prove a ſufficient leſſon to an ingenious mind.

Sect. IV. Division of Whole Numbers.

As multiplication teacheth how to find the amount of any number when repeated a given number of times, ſo diviſion, by having both the number and amount given, teacheth to diſcover how often ſuch number had been repeated in order to give that amount: or, by having, inſtead of the number, the number of times it was repeated, given; the number itſelf, (though before unknown) is by this art found out.

Briefly, it is the art of finding ſuch a part of the dividend as the diviſor expreſſes; or, of diſcovering how often one number is contained in another.

General Rule. Set down the number to be divided (called the dividend) and the number by which the diviſion is to be made (named the diviſor) on the left hand thereof, but ſeparated from it by a crooked line. Alſo make another crooked line on the right hand, beyond which the figures ariſing by the diviſion (named the quotient) are to be placed.

Then take a part of the dividend, including as many figures to the left hand, as there are figures in the diviſor; or, one more, if the number expreſſed by them, when ſo taken, is leſs than the diviſor; and find how often the diviſor is contained in, or can be taken out of ſuch part of the dividend, (which generally may be diſcovered on a compariſon of the firſt, or two firſt figures of each) and place the figure which denotes the number of times in the quotient; obſerving to multiply the diviſor thereby, to ſubtract the product from the part of the dividend aforeſaid, and to note down the remainder.

Then annex to the remainder the next following figure in the dividend, and find how often the diviſor is contained in this number, (uſually called the dividual) placing the figure, which expreſſes the number of times in the quotient, and multiplying and ſubtracting as before.

Bring down the next figure of the dividend to the remainder, and proceed again as above; continuing to do ſo, till all the figures of the dividend are in this manner brought into the operation.

N. B. When after a figure of the dividend has been annexed to a remainder, it happens that the number is leſs than the diviſor, a cypher muſt be placed in the quotient, and another figure of the dividend muſt be annexed; and the ſame muſt be repeated again, if the dividual ſhould continue ſtill leſs than the diviſor.

Note alſo, That if after ſubtraction is made, the remainder is greater than the diviſor, it ſhews that the quotient figure has been taken too little; and it muſt be ſo increaſed as to cauſe the remainder to be leſs than the diviſor.

EXAMPLE I.

Divide 4264 by 26.

```
Divr. Divid. Quot.
 26) 4264 (164
     26
     ---
     166
     156
     ---
      104
      104
      ---
      . . .
```

EXAMPLE II.

Divide 378965 by 481.

```
Divr. Divd. Quot.
481) 378965(787
     3367
     ----
      4226
      3848
      ----
       3785
       3367
       ----
        418 Remains.
```

Here in the firſt example, having placed the dividend and diviſor, as directed, I take the firſt two figures of the dividend, namely, 42, and enquire how often 26 is contained therein, and find it to be but once: I therefore place 1 in the quotient, and ſubtract 26 from 42, and the remainder is 16; to which I annex the next figure of the dividend, namely, 6; and ſo the dividual is 166. I now enquire how often 26 is contained in 166, and find it is contained ſix times; I place 6 in the quotient, and multiply the diviſor by 6, ſubtracting the product from 166; the remainder is 10, to which I annex the other figure of the dividend, namely, 4, and the dividual is conſequently 104. Again, I enquire how often the diviſor is contained in 104, and I find it is contained four times therein. I place 4 in the quotient, and muliply the diviſor thereby; the product is 104, therefore there is no remainder, and the whole quotient is 164.

The ſecond example is wrought in like manner, only in it there is a remainder after the diviſion is finiſhed of 418, which ſhews that the quotient is 787, and 418 parts out of 481 of another unit, viz. if 1 be divided into 481 parts, then the exact quotient is 787, and 418 of ſuch parts. Such parts are called fractions, and are expreſſed by placing the remainder over the diviſor, with a line between them, thus $\frac{418}{481}$. The upper number is named the numerator of the fraction, becauſe it expreſſes the number of the parts; and the lower number is called the denominator, becauſe, by it is underſtood of what denomination ſuch parts are. The whole quotient, therefore, will ſtand thus $787\frac{418}{481}$. But of fractions and their operations, we ſhall treat thereafter.

SCHOL. When the diviſor is very large, and it appears that the quotient will conſiſt of a great many figures, it is adviſeable to multiply the diviſor by all the nine digits ſeverally, and place the product in a table, before one begins the operation, for by that means the quotient figure, as well as the product of it and the diviſor, will always be had by inſpection, and ſo the buſineſs will conſiſt merely in ſubtracting.

EXAMPLE. Divide 487654327861 by 246874.

TABLE.

246874	1
493748	2
740622	3
987496	4
1234370	5
1481244	6
1728118	7
1974992	8
2221866	9

```
Diviſor.  Dividend.   Quotient.
246874)487654327861(1165186
       246874
       ------
       407803
       246874
       -------
       1609292
       1481244
       -------
        1280487
        1234370
        -------
          461178
          246874
          -------
          2143046
          1974992
          -------
           1680541
           1481244
           -------
            199297 Remainder.
```

COR. I. When the diviſor does not exceed 12, it is unneceſſary to ſet down all the ſeveral products and ſubtract as has been taught, becauſe the proceſs at each figure may very well be comprehended in the mind without that trouble, and ſo as nothing in ſuch caſe is requiſite but to put down the quotient figures, it will make the work appear more conciſe and methodical to write them down under the dividend as they ariſe, a line of ſeparation having firſt been drawn.

EXAMPLE I.

Divide 478654 by 6.

```
Divr. Dividend.
 6) 478654
    ------
```

Quotient $79775\frac{4}{6}$

EXAMPLE II.

Divide 68743254 by 11.

```
Divr. Dividend.
 11) 68743254
     --------
```

Quotient $6249386\frac{8}{11}$

Here, in the firſt example, I aſk how often 6 is contained in 47, the anſwer is 7 times, for 7 times 6 is 42, and conſequently there remains 5, which is expreſſive of ſo many tens;

tens, and which carried to the next figure (8) of the dividend, they make 58; then I ſay, how often 6 in 58? the anſwer is 9 times, and 4 remains, which carried to the next figure, they make 46; the ſixes in 46 are 7, and four remains; then the ſixes in 45 are 7, and 3 remains; and the ſixes in 34 are 5, and 4 remains, which I place over the 6 in manner of a fraction, and ſo the quotient is 79775$\frac{4}{6}$.

The other example is done after the ſame manner.

Cor. II. If the diviſor have cyphers towards the right hand, cut off ſo many of the right hand places of the dividend as there are ſuch cyphers in the diviſor; then, rejecting the cyphers in the diviſor, proceed to work as before; and, when the operation is finiſhed, annex the figures cut off to the remainder.

Thus, let the dividend be 46784, and the diviſor 300. I cut off two figures, viz. 84, from the dividend, and divide the reſt 467 by 3; the quotient is 155, and 2 remains; to which remainder I annex 84, the figures cut off, and it becomes 284, and ſo the quotient is 155$\frac{284}{300}$. The ſame muſt be obſerved for any other ſuch diviſor.

Cor. III. When the diviſor is 10, 100, 1000, 10000, &c. cut off ſo many figures to the right hand as the diviſor contains cyphers; then thoſe to the left will be the quotient, and the right hand figures will be the remainder.

Thus, let the dividend be 687543287, and the diviſor 1000; then three figures being cut off, the quotient is 687543, and the remainder 287; or the full quotient is 687543$\frac{287}{1000}$.

Cor. IV. When the diviſor is a compoſite number, that is, a number which is the product of two or more ſmall numbers, then divide by one of ſuch ſmall numbers, and that quotient by another, and ſo on till a diviſion has been made by each of them, and the laſt quotient will be the anſwer.

N. B. If there are remainders in the operation, multiply the laſt remainder by the laſt diviſor for but one, taking in the remainder belonging to ſuch diviſor (if any), then multiply that ſum by the laſt diviſor but two, and take in the remainder belonging to it, proceeding thus till you have multiplied by the firſt diviſor, and taken in the firſt remainder (if any), and the reſult will be the remainder, anſwerable to the whole diviſor.

Example. Divide 47876 by 48.

Here firſt divide by 8, and the quotient is 5984, with a remainder of 4; then I divide this quotient by 6, and the next quotient is 997, with a remainder of 2. I multiply this laſt remainder by 8, taking in the firſt remainder, and the reſult is 20. So the anſwer is 997$\frac{20}{48}$.

Schol. The beſt way of proving diviſion is to multiply the quotient by the diviſor, taking in the remainder; and if the reſult be the ſame with the dividend, the work is right, otherwiſe not.

Thus in the example on the laſt column of the preceding page, where the number is 487654327861, is given to be divided by 246874; if the quotient 1165186 be multiplied by the diviſor 246874, and the remainder 199297 be added to the product, the reſult will be the ſame as the dividend, namely 487654327861, which ſhews that the diviſion was rightly performed.

Alſo, the beſt way of proving multiplication is by diviſion; for if the product, when divided by the multiplier, give the multiplicand, the operation is true, otherwiſe it is not ſo.

The old method of proving multiplication and diviſion, by caſting out the nines, is not worth attending to, for it will often happen that the operation according to it will appear to be right, when notwithſtanding the ſame is wrong.

Having thus briefly laid down the firſt four ſimple rules of arithmetic, we ſhall now proceed to the rudiments of compound arithmetic, or the arithmetic of numbers of different denominations. In the firſt place, however, it will be proper to preſent our readers with ſome of the moſt uſeful

TABLES IN COMPOUND ADDITION.

Money of the United States.

10 mills	make	1 cent, *c.*
10 cents or 100 mills	—	1 diſme, *dm.*
10 diſmes or 100 cents	—	1 dollar, *dol.*
10 dollars	—	1 eagle.

Note, Accounts are generally kept in dollars and cents.

A TABLE OF COINS, which paſs current in the United States, with their ſtandard weight, their value in Britiſh ſterling, in the currency of the individual ſtates, and in Federal money

NAMES OF COINS.	Standard weight.		Sterling Money of Great Britain.			N. Hamp. Maſſa-R. Iſland, Con. and Virginia.			New-York and North-Carolina.			N. Jerſey, Penn. Delaware, and Maryland.			South-Carolina and Georgia.			Federal value.	
Gold.	*dwts.*	*gs.*	*£.*	*s.*	*d.*	*£.*	*s.*	*d.*	*£.*	*s.*	*d.*	*£.*	*d.*	*s.*	*£.*	*s.*	*d.*	*D.*	*C.*
A Joannes, - - -	18	0	3	12	0	4	16	0	6	8	0	6	0	0	4	0	0	16	0
A half Joannes, -	9	0	1	16	0	2	8	0	3	4	0	3	0	0	2	0	0	8	0
A Doubloon, - -	16	21	3	6	0	4	8	0	5	16	0	5	12	6	3	10	0	14	93
A Moidore, - - -	6	22	1	7	0	1	16	0	2	8	0	2	5	0	1	8	0	6	14
An Engliſh Guinea,*	5	6	1	1	0	1	8	0	1	17	4	1	15	0	1	1	9	4	66⅔
A French Guinea,*	5	6	1	1	0	1	7	6	1	16	6	1	14	6	1	1	5	4	60
A Spaniſh Piſtole, -	4	6	0	16	6	1	2	0	1	9	0	1	8	0	0	18	0	3	74
Silver.																			
An Engliſh or French Crown, -	18	17	0	5	0	0	6	8	0	8	9	0	8	4	0	5	0	1	10
A Spaniſh Dollar,	17	7	0	4	6	0	6	0	0	8	0	0	7	6	0	4	8	1	0
An Engliſh Shilling,	3	18	0	1	0	0	1	4	0	1	9	0	1	8	0	1	0	0	22
A Piſtareen, - -	3	11	0	0	10¼	0	1	2	0	1	7	0	1	6	0	0	11	0	20

* *Gold coins of Great-Britain and Portugal paſs at the rate of one Dollar for every 27 grains. Thoſe of France and Spain at the rate of one Dollar for 27⅖ grains.*

MONEY *of* GREAT-BRITAIN.

4 Farthings	make	1 penny, d.
12 Pence	—	1 ſhilling, s.
5 Shillings	—	1 crown
20 Shillings	—	1 pound, L.
21 Shillings	—	1 guinea.

TROY WEIGHT.

24 Grains	make	1 pennyweight, dwt.
20 Pennyweights	—	1 ounce, oz.
12 Ounces	—	1 pound, ℔.

This table is uſed for weighing gold, ſilver, jewels, amber, electuaries, and all liquors. One grain of troy weight is equal to one grain and a half of ſound dry wheat.

APOTHECARIES WEIGHT.

20 Grains grs.	make	1 ſcruple, ℈
3 Scruples	—	1 dram, ʒ
8 Drams	—	1 ounce, ℥
12 Ounces	—	1 pound, ℔

This weight is ſo called becauſe the apothecaries uſe it in compounding their medicines; but they buy and ſell their drugs by avoirdupois weight. Apothecaries is the ſame as troy weight, having only ſome different diviſions.

AVOIRDUPOIS WEIGHT.

16 Drams	make	1 ounce, oz.
16 Ounces	—	1 pound, ℔.
28 Pounds	—	1 quarter hundred weight
4 Quarters	—	1 hundred weight, cwt.
20 Hundred weight	—	1 ton.

By this weight are weighed all things of a coarſe or droſſy nature; ſuch as grocery and chandlers wares, and all metals except gold and ſilver. The proportion of a pound avoirdupois to a pound troy is as 17 to 14.

Of LONG MEASURE.

3 barley-corns make	1 inch, in.
12 inches	1 foot, ft.
3 feet	1 yard, yd.
5½ feet	1 pole or perch,
40 poles or perches	1 furlong,
8 furlongs	1 mile,

An inch is ſuppoſed equal to 3 barley-corns in length.

4 inches	a hand,
6 feet or 2 yards	a fathom,
3 miles	a league,

60 geometrical or nautical miles, or 69½ ſtatute miles, a degree; 360 degrees, or 25,000 geometrical miles nearly, are the circumference of the earth.

Of CLOTH MEASURE.

2 inches and a quarter make	1 nail,
4 nails	1 quarter of a yard,
4 quarters	1 yard, yd.
3 quarters	1 ell Flemiſh,
5 quarters	1 ell Engliſh,
6 quarters	1 ell French,
3 quarters and ⅔, or 33 inches	1 Spaniſh verſt.

LAND *or* SQUARE MEASURE.

144 inches make	1 ſquare foot, ft.
9 ſquare feet	1 ſquare yard, yd.
30¼ yards, or 272¼ feet	1 pole, po.
40 poles	1 rood, r.
4 roods	1 acre, a.
640 acres	1 ſquare mile, m.

Of SCOTS LAND MEASURE.

36 ſquare ells make	1 ſquare fall, f.
40 falls	1 rood, r.
4 roods	1 acre,

WINE MEASURE.

2 pints make	1 quart, q.
4 quarts, or 8 pints	1 gallon, gal.
42 gallons	1 tierce, tier.
63 gallons, or 1½ tierces	1 hogſhead, hhd.
2 hogſheads	1 pipe or butt, p.
2 pipes or 4 hogſheads	1 ton, ton.

The wine gallon contains 231 cubic inches.

10 gallons	1 anker,
18 gallons	1 rundlet,
31½ gallons	1 barrel.

By this meaſure, wines, brandies, ſpirits, perry, cyder, mead, vinegar, oil and honey are meaſured.

Of ALE *and* BEER MEASURE.

2 pints make	1 quart, q.
4 quarts, or 8 pints	1 gallon, gal.
8½ gallons	1 firkin, fir.
2 firkins	1 kilderkin, kil.
2 kilderkins	1 barrel, bl.
1½ barrels, or 54 gallons	1 hogſhead, hhd.

The ale gallon contains 282 cubic inches.

In London, the ale firkin contains 8 gallons, and the beer 9: the other meaſures above it being decreaſed and increaſed in the ſame proportion.

In the United States, we have no difference in the meaſure of liquids of any kind; a gallon of ale or beer being exactly the ſame quantity as a gallon of wine or brandy.

Of DRY MEASURE.

2 pints make	1 quart, qt.
2 quarts	1 pottle, pot.
2 pottles, or 8 pints	1 gallon, gal.
2 gallons	1 peck, pk.
4 pecks	1 buſhel, bu.
2 buſhels	1 ſtrike, ſtr.
2 ſtrikes	1 coom, co.
2 cooms	1 quarter, qt.
5 quarters	1 wey or load, wey.
2 weys	1 laſt.

The gallon dry meaſure contains 268⅘ cubic inches. At London, 36 buſhels of coals make a chaldron. A buſhel of water weaſure is 5 pecks.

By dry meaſure, all dry wares, ſuch as corn, ſeeds, fruits, roots, ſand, ſalt, coals, oyſters, &c. are meaſured.

Of Scots Dry Measure.

4 lippies make	1 peck,
4 pecks	1 firlot,
4 firlots	1 boll,
16 bolls	1 chaldron.

Of Time.

60 ſeconds make	1 minute, m.
60 minutes	1 hour, h.
24 hours	1 day, d.
7 days	1 week, w.
4 weeks	1 month, m.
13 months, 5 hours, 48 minutes, and 57 ſeconds	1 Julian year.

For a particular account of the diviſions of time adopted by different nations, ſee the articles Calendar and Year.

Of Motion.

60 ſeconds make	1 prime minute, ′.
60 minutes	1 degree, °.
30 degrees	1 ſign, s.

12 ſigns, or 360 degrees, the whole great circle of the zodiac.

CHAPTER III.

RUDIMENTS OF COMPOUND ARITHMETIC, OR THE ARITHMETIC OF NUMBERS OF DIFFERENT DENOMINATIONS.

Sect. I. Addition *of* Numbers *of* Different Denominations.

Rule. Place all numbers of the ſame denomination directly under each other, obſerving to place the columns in ſuch order, that the higheſt denomination may ſtand firſt towards the left hand, and the next inferior denomination next towards the right hand; and ſo on, that the loweſt denomination may obtain the farthermoſt place to the right hand, and draw a line under them. Then begin at the leaſt denomination; and add up all the figures in that row as in addition of whole numbers, and find by diviſion how many of the next ſuperior denomination the ſum contains; carry the ſame to the next row, but write down the overplus (if any) under the leaſt denomination, or the row which has been added.

Then add up the next row together with what was carried; finding, as before, how many of the next ſuperior denomination are contained in the ſum, in order to be carried to the next row, and writing down the overplus. Proceed in this manner till you come at the higheſt denomination, which muſt be added up and wrote down in all reſpects as in addition of whole numbers.

Example I.

Dols.	Cts.
342	42
135	19
27	4
68	27
240	11
312	0
1126	03

Example II.

l.	s.	d.
241	14	6
123	10	4½
47	13	10¼
63	18	11
114	9	7½
57	16	0½
649	3	3¾

Example III.
Troy Weight.

lb.	oz.	dwt.	grs.
47	11	15	14
14	9	13	15
71	10	10	10
67	10	15	17
81	9	10	18
12	10	4	0
297	2	10	2

Example III.
Land Meaſure.

Acr.	Roods	Perch.
3	3	37
72	1	4
21	2	16
76	1	0
9	0	3
183	0	20

Example IV.
Dry Meaſure.

Bus.	Pecks	Gal.	Pts.
8	3	1	7
19	1	0	6
8	2	1	2
6	1	1	4
3	3	0	5
46	1	0	0

Example V.
Cloth Meaſure.

Eng. Ells	Qr.	Nails.
70	4	3
61	3	2
16	2	1
10	1	0
3	0	2
162	2	0

As Federal money is eſtimated by tens, the operation in the firſt example is the ſame as in ſimple addition. In the ſecond example, I begin and caſt up the column of farthings, and the ſum is 7, or 1 penny, and 3 farthings; ſet down ¾, and carry 1 to the row of pence; the amount of which I find to be 39, or 3 ſhillings and 3 pence. I ſet down the 3 pence, and carry 3 to the row of ſhillings, which I add up and find it amounts to 83, or 4 pounds 3 ſhillings. I put down 3 ſhillings, and carry 4 to the pounds, which I add up as in common addition. The whole ſum is 649l. 3s. 3¾d.

The reſt of the examples are equally eaſy, due regard being had to the different denominations, and how many of an inferior kind make one of the next ſuperior.

Sect. II. Subtraction *of* Mixt Numbers, *or* Numbers *of* different Denominations.

Rule. Place the leſs number under the greater, and in ſuch order as is directed in addition; drawing a line under them. Then, beginning at the leaſt denomination, take the under numbers from the upper, and ſet down their reſpective remainders under them. But in caſe the under number of any denomination is greater than the upper, borrow one of the next ſuperior denomination, viz. add as many to the upper number as make 1, in the next higher denomination, and ſubtract as before, carrying 1 to the under line of the next ſuperior denomination, for that which was borrowed.

Note, the higheſt denomination muſt be ſubtracted as integers.

Example I.
Money.

	l.	s.	d.
From	27	10	6½
Take	18	12	7¼
Rem.	8	17	11¼

Example II.
Avoirdupoiſe weight.

	Tons	cwt.	qr.	lb.	oz.	dr.
From	27	12	1	15	13	14
Take	18	16	2	13	15	15
Rem.	8	15	3	1	13	15

As our intention is to be brief, where much explanation is not required, we ſhall not enumerate further examples. Thoſe who underſtand one properly, will do any other with the ſame eaſe; and a due attention to the rule, together with what has been taught before, is amply ſufficient for the underſtanding of theſe examples.

Sect. III. *To* Multiply Mixt Numbers, *or* Numbers *of* different Denominations.

Rule. Place the multiplier under the number of the leaſt denomination, and having multiplied it, reduce the product to the next ſuperior denomination, ſetting down the overplus, and carrying the quotient to be added in the multiplying of the next row; proceed thus through each denomination.

N. B. When the multiplier is a compoſite number, multiply by the factors, as in multiplication of whole numbers.

Note alſo, if the number is above 12, and not compoſite, find the product for the neareſt compoſite number; then find the product for the exceſs, or defect, of the given number, and ſubtract it from, or add it to the former product, (according as the caſe ſhall require) and the difference or ſum will be the anſwer ſought.

EXAMPLE I.

What is the value of 9 cwt. of ſugar, at
l. s. d.
4 17 $11\frac{3}{4}$ per cwt.
9
£.44 1 $9\frac{3}{4}$ Anſwer.

EXAMPLE II.

What is the value of 12lb. of tea, at
s. d.
7 $8\frac{1}{2}$ per lb.
12
£.4 12 6 Anſwer.

EXAMPLE III.

What comes 100lb. of raiſins to, at $7\frac{1}{2}$ per lb.
10
6 3
10
£.3 2 6 Anſwer.

EXAMPLE IV.

What is the value of 37 doz. of knives, at
l. s. d.
2 5 $7\frac{3}{4}$ per doz.
6
Val. of 6 doz. 13 13 $10\frac{1}{2}$
6
Val. of 36 doz. 82 3 3
Val. of 1 doz. 2 5 $7\frac{3}{4}$
Anſwer £. 84 8 $10\frac{3}{4}$

SCHOL. There are methods of obtaining the product in theſe caſes, let the multiplier be what it may, or however great; but, in general, the trouble will be conſiderable, and the anſwer will be far more readily had be the RULE OF PRACTICE.

SECT. IV. TO DIVIDE NUMBERS *of* DIFFERENT DENOMINATIONS.

RULE. Divide each denomination beginning with the higheſt, as in diviſion of whole numbers; only obſerving, that when there is a remainder in any denomination, ſuch remainder muſt be reduced to the next inferior denomination before the diviſion thereof takes place.

N. B. When the diviſor is a compoſite number, divide by the factors one after another, and the laſt quotient will be the anſwer.

EXAMPLE I.

If 7lb. of ſugar coſt 5s. $1\frac{1}{4}$d. what is that per lb?
s. d.
7) 5 $1\frac{1}{4}$
0 $8\frac{3}{4}$ Anſwer

EXAMPLE II.

Divide 44l. 1s. $9\frac{3}{4}$d into 9 into equal parts.
l. s. d.
9) 44 1 $9\frac{3}{4}$
£. 4 17 $11\frac{3}{4}$=the value of each part.

EXAMPLE III.

If 6l. 16s. 8d. be divided equally among 80 perſons, what is each man's ſhare?
l. s. d.
10) 6 16 8
8) 0 13 8
£. 0 1 $8\frac{1}{2}$ Anſwer,

EXAMPLE IV.

Divide 27l. 3s $4\frac{1}{2}$d. by 81.
l. s. d.
9) 27 3 $4\frac{1}{2}$
9) 3 0 $4\frac{1}{2}$
£. 0 6 $8\frac{1}{2}$. Anſwer.

Alike eaſy is the diviſion of Weights, and Meaſures, &c.

SECT. V. REDUCTION.

Reduction is the converſion of numbers from one name to another, but ſtill retaining the ſame value. If the reduction be to a leſs name, it is commonly called Reduction DESCENDING; but if to a greater, Reduction ASCENDING.

REDUCTION DESCENDING.

RULE. Multiply the higheſt denomination, given, by ſo many of the next leſs, as make one of that greater, and thus continue until you have brought it down as low as your queſtion requires.

EXAMPLE. In £. 95 11 $5\frac{3}{4}$ how many farthings.
95 11 $5\frac{3}{4}$
multiplied by 20=the number of ſhillings in a pound.
1911
by 12=the number of pence in a ſhilling.
22937
by 4=the number of farthings in a penny
Anſwer=91751 farthings.

NOTE. In multiplying by 20, I added in the 11s, in multiplying by 12 I added in the 5 pence, and in multiplying by 4 I added in the 3 farthings; and in all caſes of a like nature, we muſt proceed in a ſimilar manner.

Of REDUCTION ASCENDING.

RULE. Divide the loweſt denomination given, by ſo many of that name, as make one of the next higher, and thus continue till you have brought it into that denomination, which your queſtion requires.

EXAMPLE. How many pence, ſhillings and pounds in 684967 farthings.
farthings in a penny,=4)684967
pence in a ſhilling,=12)171241 3 qrs.
ſhillings in a pound=20)14270 1 d.
£. 713 10 s. 1 d. 3 qrs.
Anſwer. 171241 d. 14270 s. and 713 l.

NOTE. The remainder is always of the ſame name with the dividend.

REDUCTION DESCENDING *and* ASCENDING.

There are many queſtions may be propoſed in Reduction for the ſolution of which, both multiplication and diviſion are neceſſary. It would be ſuperfluous to ſuggeſt any directions for the performing of ſuch operations, as the lear-ner can be at no loſs, if he ſufficiently underſtand the preceding rules and pay a proper attention to the nature of the queſtion.

Example. In 8640 French crowns, how many cents, dollars and half joannes.

8640
number of cents in a crown=110

cents in a dollar=100)950400

dols. in a half joannes=8)9504

1188

Anſwer. 950400 cents, 9504 dollars and 1188 half joannes.

When it is required to know, how many ſorts of coin, of different values, and of equal number are contained in any number of another kind, reduce the ſeveral ſorts of coin into the loweſt denomination mentioned, and add them together for a diviſor; then reduce the money given into the ſame denomination for a dividend, and the quotient, ariſing from the diviſion will be the number required. The ſame direction muſt, likewiſe, be obſerved in weights and meaſures.

Example I. In 375 half joannes, how many French crowns, dollars, half dollars, engliſh ſhillings, piſtareens, diſmes and cents and of each an equal number.

A half Joannes is 8 dollars that is		800 cents.
A French crown	is	110 cents.
A dollar	is	100 do.
A half dollar	is	50 do.
An Engliſh ſhil.	is	22 do.
A piſtareen	is	20 do.
A diſme	is	10 do.
		1 cent.

Diviſor 1113 cents.
375 half joannes.
8 dollars in a half joannes.

3000
100 cents in a dollar.

Dividend 300000 cents.
1113)300000 | 269 of each and 603 cents or 6 dollars and 3 cents over.
2226

7740
6678

10620
10017

603

Example II. A ſilverſmith received 3 ingots of ſilver, each weighing 27 ounces, with directions to make them into ſpoons of 2 oz. cups of 5 oz. ſalts of 1 oz. and ſnuff boxes of 2 oz. and to deliver an equal number of each. What was the number of each?

ſpoons 2 — 3 ingots of ſilver.
cups 5 — 27 ounces in each.
ſalts 1
ſnuff boxes 2 — dividend 81 ounces.

Diviſor 10 ounces. 10)81(8=Anſwer.
8 of each and 1 oz. over.

CHAPTER IV.

SINGLE RULE OF THREE.

1ſt. This Rule takes its name from having always, in the queſtions to which it relates, three terms given to find a fourth, which ſhall have the ſame proportion to one of the given terms as ſubſiſts between the other two; it is therefore ſometimes called the Rule of Proportion; and, becauſe of its excellence and uſe, it is alſo named the Golden Rule.

2d. Before the operation is begun, the given terms muſt be arranged in one line, with two points between the 1ſt and 2d, and four points between the 2d and 3d. Thus, 2 : 4 : : 6; and the reading of them is after this manner, viz. as 2 is to 4, ſo is 6 to the fourth number or anſwer. When the fourth term is found (or given) it is frequently ſet after the third term, with two points between them.

3d. To arrange terms properly, is called ſtating the queſtion; to perform which, obſerve that the term, whereon the demand of the queſtion reſts, is to be made the ſecond term; it is generally preceded by the interrogative of the queſtion, viz. the words, I demand? How much? How many? How long? What will? &c.

The firſt term is always of the ſame kind, or nature, as the ſecond; and the third is of the ſame kind, or nature, as the fourth term or anſwer.

4th. When the 4th term or anſwer bears ſuch proportion to the 3d as the 2d does to the 1ſt, the queſtion is called Direct; which is the caſe when there is the ſame affection between the 3d and 4th, as there is between the 1ſt and 2d, viz. when the 2d term is either greater or leſs than the firſt; and it is neceſſary that the 4th be in like manner either greater or leſs than the 3d.

5th. When the 4th term bears ſuch proportion to the 3d as the 1ſt does to the 2d, the queſtion is ſaid to be Inverſe; the affection between the 3d and 4th being, under ſuch circumſtance, of a contrary nature to the affection between the 1ſt and 2d. This happens when the 2d term is either greater or leſs than the firſt; and it is neceſſary, that the fourth be in the former caſe leſs, and in the latter, greater than the 3d.

Having by theſe inſtructions ſtated the queſtion, and diſcovered from its nature whether the ſame be direct or inverſe, then to perform the operation, obſerve the following rules.

I. Reduce the 1ſt and 2d terms to one and the ſame denomination, if they are not ſo already; and the 3d term to the loweſt denomination, if it be a number of ſeveral denominations.

II. If the queſtion be direct, multiply the 2d and 3d terms together, and divide the product by the firſt, and the quotient will be the anſwer in the ſame denomination with the 3d term, after its deduction, if any was made.

III. If the queſtion be inverſe, multiply the 1ſt and 3d terms together, and divide the product by the 2d, and the quotient will be the anſwer, as before.

N. B. Sometimes when the 3d term is of ſeveral denominations, it will be unneceſſary to reduce it to the loweſt, viz. when the 1ſt and 2d terms are ſuch, that the Multiplication and Diviſion may be eaſily performed without it.

Note alſo, when the given terms are fractions, the reciprocal of the firſt and ſecond term, according as the queſtion is Direct or Inverſe, may be taken in lieu of ſuch term, and then the anſwer will be had by multiplying all the terms together.

Example I. If 5 oxen coſt 55l. 10s. what will 21 oxen coſt at that rate?

oxen. oxen. l. s.
As 5 : 21 : : 55 10 (: the Anſwer)
20

1110 ſhillings.
21

5) 23310 product of 2d and 3d terms.

2|0) 466|2 anſwer in ſhillings.

£. 233 3s. anſwer in pounds.

Explanation. The demand of the queſtion in the above example, is the value of 21 oxen: therefore, by Definition 3d, 21 oxen muſt be the ſecond term; then, as (by the ſaid Definition) the firſt term muſt be of the ſame kind or nature with the ſecond, it is plain that 5 oxen muſt be the firſt term; and the other number, namely 55l. 10s. which is of the ſame nature with the anſwer, muſt be the third term; wherefore I write them down in order as above, and the proper reading thereof in that order is, as 5 is to 21, ſo is 55l. 10s. (the price of 5) to the anſwer (or the price of 21). Then, to determine whether the queſtion be Direct or Inverſe, I obſerve, that the ſecond term is greater than the firſt, and the anſwer muſt be greater than the third, in the ſame proportion, and therefore (by Definition 4th) the queſtion is direct.

Then, according to Rule I. I reduce the third term into ſhillings; alſo I multiply the ſame by the ſecond term, and divide the product by the firſt, and the quotient is the anſwer in ſhillings, according to Rule III. which, being divided by 20, gives the anſwer in pounds.

Scholium I. In order to abbreviate the operations, it will be convenient to connect the two terms, which are to be multiplied together with the ſign of multiplication between them, and to write the diviſor under them in manner of a fraction, which will be a fractional expreſſion for the anſwer, to be brought into its loweſt terms by Reduction of Fractions.

Schol. II. Sometimes alſo the operation may be ſhortened thus: obſerve how often that term which is the diviſor is contained in one of the other terms (noting the Remainder) and multiply the remaining term by the quotient, and take parts for the remainder, to be added to the product.

Schol. III. When the diviſor is a compoſite number, and one of the other terms is leſs than the diviſor, but no aliquot part thereof, obſerve what aliquot part of the diviſor comes neareſt to the ſaid leſs term; divide the remaining term by the number denoting the aliquot part, and it will give the value, anſwering to the number expreſſed by the ſaid aliquot part of the diviſor. Then take aliquot parts of this value for the exceſs or defect, and ſubtract or add the ſame, as the caſe ſhall be, and it will give the anſwer.

Contractions of this kind will often prove extremely uſeful, though they have been ſeldom noticed by writers on Arithmetic.

Thus the preceding example may, by Scholium I. (after the reduction) be written, $\frac{1110\times21}{5}$ = anſwer in ſhillings, and $\frac{1110\times21}{5\times10}$, or $\frac{1110\times21}{100}$ = anſwer in pounds = 11.10 × 21 = 233.1 l. or 233 l. 2s.

Or, by following the ſecond Scholium, I obſerve that 5 is contained 4 times in 21, but that there is a remainder of 1. Therefore I multiply 55 l. 10s. by 4, and it gives 222 l. to which I add the fifth part of 55 l. 10s. viz. 11 l. 2s. (becauſe 1 is the fifth part of 5,) and the ſum is 233 l. 2s. as before.

Note. In following this method, when the remainder is large, it will be better to take the quote 1 more, and ſo deduct inſtead of adding, a proportionable ſhare, anſwerable to the parts in exceſs.

Thus, in the foregoing example, if the ſecond term had been 24, then the neareſt quote, by the firſt term, would have been 5, but producing an exceſs of 1. Therefore, in that caſe, I ſhould have multiplied the 55 l. 10s. by 5, and deducted a fifth part from the product, in order to obtain the anſwer.

Example II. Suppoſe a ſhip ſails 24 leagues in 12 hours, (or half a natural day,) how many leagues will ſhe ſail in a week, at the ſame rate?

Hours. Week. Leag.
Here the ſtating will be thus: As 12 : 1 : : 24 (: the anſwer.)

But as in 1 week there are 14 half days, therefore, when the firſt and ſecond terms are reduced to the ſame denomination, the proportion will be, As 1 : 14 : : 24 : Anſwer.

And $\frac{14\times24}{1}$ = 336 leagues, the diſtance ſought.

Example III. If 9 yards of cambric coſt 5l. 12s. what will 72 yards coſt at that rate?

Yds. yds.
As 9 : 72 : : 5 l. 12s. (Anſwer.)

Therefore the anſwer = $\frac{5\text{ l. }12\text{s.}\times72}{9}$ = 5 l. 12s. × 8 = 44 l. 16s.

Example IV. If 8 men can finiſh a piece of work in 15 days, what number of men will be required to perform the ſame in 24 days?

Days. Days. Men.
As 15 : 24 : : 8 : Anſwer.

Here the proportion is Inverſe, becauſe the ſecond term is greater than the firſt; and the anſwer muſt be leſs than the third; for it is not neceſſary to have ſo many men to do a piece of work, if 24 days be allowed, as would be employed, provided 15 days only were allowed.

Therefore, $\frac{8\times 15}{24}=\frac{15}{3}=5$, the number of men required.

Example V. If 56 yards of ſhalloon, of 3 quarters wide, are neceſſary for the linings of 10 ſuits of cloaths, how many yards of ſhalloon, of 5 quarters wide, would it take to line them ?

Qrs. Qrs. Yards.
As 3 : 5 : : 56 : (Anſwer.)

Here the queſtion is alſo Inverſe, therefore, $\frac{3\times 56}{5}=56\times.6=33.6$ yards$=33.\frac{3}{5}$ yards$=$the Anſwer: or $\frac{3\times 56}{5}=3\times 11\frac{1}{5}=33\frac{3}{5}$, as before.

Example VI. If 60 gallons of water, in 35 minutes time, be conveyed through a pipe into a ciſtern which holds 200 gallons, and if, by a cock in the ciſtern, there runs out 45 gallons in the ſame time, how long will the ciſtern be in filling, provided the cocks keep running at the above rates?

Here it is evident, that, at the end of 35 minutes, there will be 15 gallons in the ciſtern, and that it will keep filling at the ſame rate.

Gal. Gal. Min.
Hence, As 15 : 200 : : 35 : (Anſwer.)

Therefore, $\frac{200\times 35}{15}=\frac{200\times 7}{3}=\frac{1400}{3}=466\frac{2}{3}$ minutes, or 7 hours, 46 minutes, and 40 ſeconds, the Anſwer.

Example VII. If 54 oxen coſt 411 l. 1s. 6d. what is the price of 20 oxen at that rate ?

Oxen. Oxen.
As 54 : 20 : : 411 l. 1s. 6d. : (Anſwer.)

Operation.

3)411	1	6
9)137	0	6
15	4	6
£.152	5	0 Anſwer.

Here I divide the price by 3, and it gives the price of 18, becauſe 18 is the $\frac{1}{3}$ part of 54. Then, to obtain the price of the remaining 2, I divide this by 9, becauſe 2 is the $\frac{1}{9}$ part of 18. The ſum of theſe is 152l. 5s. the Anſwer ſought.

Other queſtions might be given to illuſtrate this Rule, but a due attention to what has been delivered, will afford ſufficient inſtruction for every caſe, and in a more conciſe and methodical method than is generally given by writers.

CAAPTER V.

DOUBLE RULE OF THREE.

The Double Rule of Three, by ſome called the Rule of Five, is when five terms are given to find a ſixth.

The beſt method of ſolving queſtions of this kind, is to make two ſtatings in the ſingle rule ; but to ſuſpend the operation till it is diſcovered, from the nature of the queſtion, which of the terms will be multipliers, and which of them diviſors.

Then the three terms which are multipliers may be connected by ſigns of multiplication between them, and the two terms which are diviſors may be connected in like manner, and written under the other with a line between them, in form of a fraction, to be reduced to its leaſt terms, as has been ſhewn in the ſingle rule. And in general all the contractions, which have been introduced there, may be occaſionally uſed here.

Example I. If the carriage of 100 lb. weight for 30 miles coſt 2 ſhillings, what will the carriage of 500 lb. coſt for 200 miles ?

As 100lb. : 500 lb. : : 2s. : (1ſt Anſwer.)
As 30 m. : 200 m. : : 1ſt Anſwer : (Anſwer required.)

Then $\frac{500\times 2\times 200}{100\times 30}=\frac{50\times 2\times 2}{3}=\frac{200}{3}=66$s. $\frac{2}{3}=3$l. 6s. 8d. $=$ the Anſwer.

Explanation. Here I ſay by the ſingle rule, as 100 lb. is to 500 lb. ſo is 2s. the value of the carriage of 100 lb. for 30 miles, to the value of 500 lb. for 30 miles.

Then, as 30 miles is to 200 miles, ſo is the firſt anſwer (or the value of 500 lb. for 20 miles) to the value of 500 lb. for 200 miles.

The firſt anſwer by the ſingle rule $=\frac{500\times 2:}{100}$ and the ſecond Anſwer therefore $=\frac{500\times 2}{100}\times 200\div 30=\frac{500\times 2\times 200}{100\times 30}$ as above.

Or, ſince, from the nature of the queſtion, both the ſtatings are direct, therefore the firſt terms of each are diviſors, and the reſt multipliers ; and hence the procedure is evident.

This mode is vaſtly ſuperior to that of working out the firſt ſtating by itſelf, not only becauſe there will be frequently a remainder in the firſt operarion, which, if neglected in the ſecond, will ſometimes produce a material error in the required anſwer, or, if retained, will make the work very troubleſome and tedious, but, becauſe conſiderable advantages will often occur in this way, which cannot poſſibly happen in the other.

Example II. If 68 men can build a wall in 27 days, when the day is 9 hours long, in how many days will 54 men build the ſame when the day is 17 hours long ?

Men. Men. Days.
As 68 : 54 : : 27 : (1ſt Anſwer.)
Hours. Hours.
9 : 17 : : 1ſt Anſwer : (to true Anſwer.)

Then $\frac{68\times 27\times 9}{54\times 17}=\frac{4\times 9}{2}=2\times 9=18$ days, the Anſwer.

Here both the ſtatings are inverſe ; for, in the firſt ſtating it is evident, that 54 men muſt require a longer time for the doing of a piece of work than is neceſſary in caſe 68 men are employed ; and therefore the fourth term, or anſwer, muſt be greater than the third, and of courſe will not have the ſame affection to it as the ſecond has to the firſt.

In the ſecond example it is plain, that when the day is 17 hours long, a piece of work will be done in fewer days, than when the day is only 9 hours long ; and therefore the fourth term, or the required anſwer, muſt be leſs than the third term ; or the time that 54 men can do a piece of work in, when the day is 9 hours long, ſuppoſed to be obtained by the firſt ſtating. Wherefore, this ſtating is alſo inverſe ; and therefore 54 and 17 are the diviſors, and the reſt multipliers.

This queſtion is called a queſtion of the Double Rule of Three Inverſe. Sometimes one ſtating will be direct, and the other inverſe, and ſuch queſtions are alſo deemed inverſe; wherefore, ſince there is ſuch a difference in queſtions of this kind, this mode of ſolution, which diſcovers at once what ſtatings are direct, and which are inverſe, muſt be infinitely preferable to that ambiguous way (uſed by many authors) of placing all the five terms in one line, after a certain order; and then giving rules for operation, according as the queſtion is conceived to belong to the direct or inverſe rule; without conſidering whether an inverſe queſtion involves two direct ſtatings, or only one.

Example III. If 24 ſtudents ſpend 64 pounds in 16 months, what ſum of money will ſerve 9 ſtudents 8 months?

Stu. Stu.
As 24 : 9 :: 64 : (1ſt Anſwer.)
M. M.
As 16 : 8 :: 1ſt Anſwer: (required Anſwer.)

Then $\frac{9\times 64\times 8}{24\times 16}=\frac{9\times 4}{3}=3\times 4=12$ *l.* the Anſwer.

Schol. Sometimes queſtions will occur wherein 3 or more ſtatings are neceſſary, but the ſame method may be applied to all.

Example IV. If the carriage of 150 feet of wood, that weighs three ſtone per foot, comes to 3 l. for 40 miles, how much will the carriage of 54 feet of free ſtone, that weighs eight ſtone per foot, come to for 25 miles?

Feet. Feet. l.
As 150 : 54 :: 3 : (1ſt Anſwer.)
Stone. Stone.
As 3 : 8 :: 1ſt Anſwer : (2d Anſwer.)
Miles. Miles.
As 40 : 25 :: 2d Anſwer : (required Anſwer.)

Then $\frac{54\times 3\times 8\times 25}{150\times 3\times 40}=\frac{54}{6\times 5}=\frac{9}{5}=1\frac{4}{5}$ l. $=$ 1 l. 16. the Anſwer ſought.

Here all the ſtatings are direct, as is evident on inſpection, and therefore 150, 3, and 40, are the diviſors, and the reſt multipliers.

Schol. Sometimes the given numbers will be ſuch as cannot be reduced at once to an anſwer, by this method of placing them in a fractional manner; but it will, nevertheleſs, be convenient to expreſs them ſo at firſt, as they will be a guide to the future operation, and in moſt caſes ſome advantages may be derived from it.

N. B. It is in this, as in the ſingle rule, commonly neceſſary to reduce the 1ſt and 2d terms of each ſtating to one and the ſame denomination; and the third term (unleſs the reſt of the numbers are ſuch, that the operation may be performed without that trouble) muſt be reduced to the loweſt denomination mentioned in it.

CHAPTER VI.

RULE of PRACTICE.

Practice is a compendious way of caſting up the value of any articles, whether by weight or meaſure, the price of the integer being given.

It is generally formed by taking ſuch aliquot parts of the given quantity, as the price is of a pound, ſhilling, &c. The following are the moſt uſual methods.

1ſt. When the price is leſs than a penny, divide by the aliquot parts of a penny, and then by 12 and by 20, and you will have the value required.

2d. When the price is an aliquot part of a ſhilling, divide by ſuch aliquot part, and the quotient will be the anſwer in ſhillings; which, if above 20, muſt be reduced into pounds.

3d. When the price is pence and farthings, and not an aliquot part of a ſhilling, divide the given number by ſome aliquot part of a ſhilling; and then conſider what part of the ſaid aliquot part the reſt is, and divide the quotient thereby; and the laſt quotient, together with the former, will be the anſwer in ſhillings, which muſt be reduced into pounds as before; or the price may be frequently ſo divided, that each part will be ſome aliquot part of a ſhilling, and then a proper aliquot part of the given number muſt be taken for each, and their ſum collected as above.

4th. When the price is an even number of ſhillings, without pence and farthings, multiply the given number by the half thereof; doubling the firſt right hand figure of the product for ſhillings, and thoſe to the left are pounds.

5th. When the price is any odd number of ſhillings, except 5, either multiply thereby and divide by 20, or find the value of the greateſt even number, as above; to which add $\frac{1}{20}$ of the given number, for the odd ſhilling.

6th. When the price is an aliquot part of a pound, as 10s. 6s. 8s. 5s. 4s. &c. divide the given quantity by ſuch aliquot part, and the quotient will be the anſwer in pounds.

7th. When the price is ſhillings, pence, &c. it muſt be ſo divided, that one or more of the foregoing rules may be applied, as ſhall appear moſt convenient; and when it can be done, aliquot parts of parts may be taken.

8th. When the given number is a whole number, with parts annexed, find the value of the whole number by the preceding methods; to which add a part of the price anſwerable to the given parts.

9th. When the given quantity, whoſe value is ſought, is of ſeveral denominations, and the price is of an integer of the higheſt denomination, multiply the price by the number of the higheſt denomination, or find the value thereof by ſome of the foregoing methods; then take the ſame parts of the price for thoſe of the lower denominations, as they are of an unit of the higheſt denomination, and the ſum of all will be the anſwer.

10th. When the given quantity is of ſeveral denominations, and the price is that of an unit of ſome lower denomination, the higher denomination muſt be reduced to ſuch lower denomination; and then the laſt, or ſome preceding method muſt be uſed.

Table of Aliquot Parts.

Parts of a Pound.				Parts of a Shilling.		
s.	d.					
10	0	is	$\frac{1}{2}$	6d	is	$\frac{1}{2}$
6	8	—	$\frac{1}{3}$	4	—	$\frac{1}{3}$
5	0	—	$\frac{1}{4}$	3	—	$\frac{1}{4}$
4	0	—	$\frac{1}{5}$	2	—	$\frac{1}{6}$
3	4	—	$\frac{1}{6}$	$1\frac{1}{2}$	—	$\frac{1}{8}$
				1	—	$\frac{1}{12}$

Parts of a Pound.

2 6 — $\frac{1}{8}$
2 0 — $\frac{1}{10}$
1 8 — $\frac{1}{12}$
0 8 — $\frac{1}{30}$
0 6 — $\frac{1}{40}$
0 4 — $\frac{1}{60}$
0 3 — $\frac{1}{80}$
0 2 — $\frac{1}{120}$

Parts of a Cwt.
lb.

56 — $\frac{1}{2}$
28 — $\frac{1}{4}$
14 — $\frac{1}{8}$
16 — $\frac{1}{7}$
8 — $\frac{1}{14}$
7 — $\frac{1}{16}$

I. What is the value of 4443 at $7\frac{3}{4}$d. each ?

4d is $\frac{1}{3}$ | 4443
3d is $\frac{1}{4}$ | 481
$\frac{3}{4}$ is $\frac{1}{4}$ of 3d $\frac{1}{4}$ | 1110 9
277 $8\frac{1}{4}$
2|0 | 286 | 9 $5\frac{1}{4}$
£. 143 9 $5\frac{1}{4}$ An.

Or thus :

6d is $\frac{1}{40}$ of a l. 4|0 | 444 | 3
$1\frac{1}{2}$d is $\frac{1}{4}$ of 6d $\frac{1}{4}$ | 111 1 6
$\frac{1}{4}$ is $\frac{1}{6}$ of $1\frac{1}{2}$ $\frac{1}{6}$ | 27 15 $4\frac{1}{2}$
4 12 $6\frac{3}{4}$
Anſw. £. 143 9 $5\frac{1}{2}$

II. Given 2756 pieces at 7s. each.

2756
3
826 16
137 16
£. 964 12s An.

Or thus.

2756
7
2|0|1929|2
£. 964 12s An.

III. $\frac{1}{6}$|576 pieces at 3s. 4d. each.
96 £. Anſwer.

IV. What is the value of $5678\frac{3}{4}$ lb. at 4d. per lb.

4d is $\frac{1}{60}$ of a £. 6|0|567|8
£. 94 12 8
The value of $\frac{1}{2}$lb. is 2
$\frac{1}{4}$lb. is 1
Anſwer £. 94 12 11

V. What is the value of 3 cwt. $22\frac{3}{4}$lb. at 13s. and $5\frac{3}{4}$d per cwt.

s. d.
13 $5\frac{3}{4}$
3
£. 2 0 $5\frac{1}{4}$
14lb. is — $\frac{1}{8}$ | 1 $8\frac{1}{4}$ nearly
7 is $\frac{1}{2}$ of 14lb. $\frac{1}{2}$ | 10 do
1 is $\frac{1}{7}$ of 7 $\frac{1}{7}$ | $1\frac{1}{2}$ do
$\frac{1}{2}$ is $\frac{1}{2}$ of 1 $\frac{1}{2}$ | $\frac{3}{4}$ do
$\frac{1}{4}$ is $\frac{1}{2}$ of $\frac{1}{2}$ $\frac{1}{2}$ | $\frac{1}{4}$ do
£. 2 3 2 Anſw.

CHAPTER VII.

TARE AND TRETT.

1ſt. **Tare** is an allowance to the buyer of any commodity for the weight of the box, caſk, &c. containing the ſame.

2d. **Trett** is an allowance of 4lb. in every 104lb. on account of waſte, duſt, &c.

3d. **Cloff** is an allowance of 2lb. in every 3 cwt. to make the weight hold out when retailed.

4th. **Gross Weight**, the whole weight both of package and goods before any of the aforeſaid allowances are deducted from the groſs.

6th. **Neat Weight** is that which remains after all the allowances are deducted.

The Rules for making theſe allowances are reſolved into the five following caſes.

I. When Tare only is allowed, and the ſame is ſo much in the whole, ſubtract it from the groſs, and the remainder will be the Neat Weight.

II. When the caſe is as before, but the Tare is at ſo much per box, caſk, &c. multiply the number of boxes, caſks, &c. by the tare of one of them, ſubtract the product from the groſs, and the remainder will be the Neat Weight.

III. When the caſe is as before, but the Tare is at ſo much per cent. divide the groſs weight by the aliquot parts of a cwt. as in the Rule of Practice ; ſubtract the quotient (or the ſum or difference of the quotients, as the caſe ſhall be) from the groſs, and the remainder will be the Neat Weight.

IV. When both Tare and Trett are allowed, divide the Suttle Weight (or that weight which remains after the Tare is deducted) by 26 ; ſubtract the quotient from the ſubtle, and the remainder is the Neat.

V. When Tare, Trett, and Cloff are allowed, deduct the Tare and Trett as above directed, and divide the Suttle by 168 ; then ſubtract the quotient from the Suttle, and the remainder will be the Neat Weight.

Examples.

I. Let the Groſs be 28 cwt. 2 qrs. 18lb. and the Tare 1 cwt 1 qr. 21lb. 8 oz. required the Neat Weight ?

Here, 1 cwt. 1 qr. 21 lb. 8 oz. ſubtracted from the Groſs, leaves 27 cwt. 0 qr. 24 lb. 8 oz. the Neat Weight required.

II. What is the Neat Weight of 7 hogsheads of tobacco, each weighing 5 cwt. 2 qrs. 21 lb. Groſs, and the Tare 98 lb. per hogſhead ?

Here, 5cwt. 2 qrs. 21 lb. multiplied by 7, gives 39cwt. 3 qrs. 7 lb. the whole Groſs ; and 98 lb. or 3 qrs. 14 lb. multiplied by 7, gives 6 cwt. 0 qr. 14 lb. the whole Tare, which ſubtracted from the Groſs, leaves 83 cwt. 2 qrs. 21lb. the Neat Weight required.

III. Let the Groſs be 16 cwt. 2 qrs. 14 lb. and the Tare 16 lb. per cwt. what is the Neat Weight ?

Here, 16 lb. is $\frac{1}{7}$ of a cwt. Wherefore, divide the Groſs by 7, and the quotient, 2 cwt. 1 qr. 14 lb. is the Tare, which ſubſtracted from the Groſs, leaves 14 cwt. 1 qr. the Neat Weight.

IV. Suppoſe the Groſs Weight to be 154 cwt. 2 qrs. 8 lb. and the Tare 12 lb. per cwt. what is the Neat Weight, allowing alſo for Trett ?

OPERATION.

Cwt.

16 lb. is $\frac{1}{7}$ | 154

4 is $\frac{1}{4}$ of 16 $\frac{1}{4}$ | 22 qrs.

Subtract 5 2

16 2

6 13$\frac{3}{4}$ oz. Tare of 2 qrs. 8 lb.

16 2 6 13$\frac{3}{4}$ whole Tare.

2 qrs. is $\frac{1}{2}$ | 12 lb.

8lb. is $\frac{1}{7}$ of 2 qrs. $\frac{1}{7}$ | 6 oz.

13$\frac{3}{4}$ nearly.

Tare of 2 qrs. 8lb. 6 13$\frac{3}{4}$

	Cwt.	qrs.	lb.	oz.	
Groſs	164	2	8	0	
Tare	16	2	6	13$\frac{3}{4}$	Subtract
	26)134	0	1	2$\frac{1}{4}$	Suttle
	5	1	6	7$\frac{1}{2}$	nearly=Trett
Anſw.	142	2	22	10$\frac{3}{4}$	Neat Weight.

V. What is the Neat Weight of two hogsheads of tobacco, each weighing 5 cwt. 3 qrs. 20 lb. Groſs, the Tare being 7 lb. per cwt. and the Trett and Cloff as uſual.

OPERATION.

	Cwt.	qrs.	lb.	
	15	3	20	
			2	
	31	3	12	groſs.
7lb is $\frac{1}{16}$	1	3	27	tare.
	26)29	3	13	
	1	0	16$\frac{1}{2}$	nearly, trett
	168)28	2	24$\frac{1}{2}$	ſuttle.
	0	0	19	cloff.
Anſw.	28	2	5$\frac{1}{2}$	Neat Weight.

N. B. In ſome commodities 2 lb. in 100 lb. is allowed for cloff, in which caſe, inſtead of dividing the Suttle by 168, it muſt be divided by 50 only, and the quotient will be the Cloff to be ſubtracted as before.

Note alſo, that in calculating oil, if the Neat Weight be reduced into half pounds, and divided by 15, the quotient will be the neat gallons, becauſe 7$\frac{1}{2}$ lb. are allowed to the gallon.

CHAPTER VIII.

VULGAR FRACTIONS.

SECT. I. DEFINITIONS.

A Fraction, or broken number, is an expreſſion of one or more parts of any number.

The number of parts into which the number is ſuppoſed to be divided, is called the Denominator; and the number of thoſe parts expreſſed by the fraction, is called the Numerator. Theſe two numbers are in general named the Terms of the fraction.

If the number of which the fraction is a part, or parts, be 1, it is called a Simple Fraction; and is denoted by the numerator written above the denominator, with a ſmall line between them: So, $\frac{1}{3}$ denotes one third of one; $\frac{7}{8}$ denotes ſeven eighths of one.

But if the number be different from 1, it is called a Compound, and is denoted by the word *of*, and the number ſubjoined to the numerator and denominator, expreſſed as before. So, $\frac{1}{2}$ of 6, denotes one half of 6; $\frac{2}{3}$ of 8, denotes two thirds of 8; and $\frac{3}{4}$ of $\frac{5}{8}$, denotes three fourths of five eighths of 1.

Simple fractions, whoſe numerators are leſs than their denominators, are called Proper Fractions. And thoſe whoſe numerators are equal to or greater than their denominators, are called Improper Fractions.

The expreſſion formed from an integer and a fraction joined together, is called a Mixt Number. If both the numerator and denominator of a fraction be multiplied or divided by the ſame number, the fraction will retain its original value. All computations in fractions are founded on this principle.

SECT. II. REDUCTION *of* VULGAR FRACTIONS.

RULE I. *To abbreviate or reduce fractions to leſs terms.* Divide the terms of the given fraction by any number which will divide them without a remainder: the quotients will be the terms of a new fraction, equal in value to the former: This may be abbreviated again, and the next again, and ſo on, till it appear that there is no number greater than 1 that will divide them, in which caſe, the fraction is ſaid to be in its Leaſt terms.

EXAMPLE.

Let $\frac{42}{72}$ be propoſed to be abbreviated.

$\frac{42}{72}=\frac{21}{36}=\frac{7}{12}$, by dividing firſt by 2 and then by 3.

If the numerator and denominator, inſtead of being expreſſed by ſingle numbers, are expreſſed by the continual product of ſeveral, ſuch numbers as are both in the numerator and the denominator may be left out without changing the value of the fraction:

Thus $\frac{7\times3\times8\times10}{7\times8\times11}=\frac{3\times10}{11}=\frac{30}{11}$

If the fraction muſt be brought to its leaſt terms at one diviſion, divide its terms by their greateſt common meaſure, which common meaſure is found by dividing the greater term by the leſs, and this diviſor by the remainder; and ſo on, always dividing the laſt diviſor by the laſt remainder, till 0 remains; then is the laſt diviſor the greateſt common meaſure required.

EXAMPLE. Reduce $\frac{246}{372}$ to its leaſt terms at one diviſion.

First, 246)372(1
126)246(1
120)126(1
The common meaſure 6)120(20

Then $\frac{246\div6}{372\div6}=\frac{41}{62}$

RULE II. *To reduce an improper fraction to its equivalent whole or mixt number.* Divide the numerator by the denominator, and the quotient will be the integer or mixed number required.

Examples.

$$\frac{12}{3}=4.\quad \frac{37}{11}=3\frac{4}{11}\quad \frac{15}{7}=2\frac{1}{7}$$

Rule III. *To reduce an integer to an equivalent fraction of a given denominator.* Multiply the integer by the given denominator, and the product will be the numerator required.

Example. Reduce 7 to a fraction whoſe denominator ſhall be 4.

$$7=\frac{7\times4}{4}=\frac{28}{4}$$

Rule IV. *To reduce a mixt number to an equivalent improper fraction.* Multiply the integer by the denominator of the fraction, to the product add the numerator; then the ſum written above the denominator will form the fraction required.

Example. Reduce $2\frac{3}{7}$ to a fraction.

$$2\frac{3}{7}=\frac{2\times7+3}{7}=\frac{14+3}{7}=\frac{17}{7}$$

Rule V. *To reduce a compound fraction to an equivalent ſimple one.* Multiply all the numerators together for the numerator, and all the denominators together for the denominator of the ſimple fraction required. If part of the compound fraction be an integer or a mixt number, reduce it to a fraction by one of the former caſes.

Example. Reduce $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ of 5 to a ſimple fraction.

$\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{5}{1}=\frac{1\times2\times3\times5}{2\times3\times4\times1}=$ (by omitting the common terms, 1, 2, and 3) $\frac{5}{4}$

Rule VI. *To reduce fractions of different denominators to equivalent fractions of a common one.* If the fractions can be conveniently reduced to a common denominator, by applying or dividing their terms, proceed by that method. But, if not, multiply each numerator continually into all the denominators, except its own, for each new nominator; and multiply all the denominators together for the common denominator. In this and ſeveral other operations, when any of the propoſed quantities are integers, mixt numbers, or compound fractions, they muſt be reduced by their proper rules, to the form of ſimple fractions.

Example.—Reduce $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{3}{4}$ to a common denominator.

$$\text{Thus } \frac{1}{2},\ \frac{2}{3},\text{ and }\frac{3}{4}=\frac{12}{24},\ \frac{16}{24},\text{ and }\frac{18}{24}$$

$$\text{or}=\frac{6}{12},\ \frac{8}{12},\text{ and }\frac{9}{12}$$

Rule VII. *To find the value of proper fractions in numbers of inferior denominations.* Multiply the numerator by the integer, and divide by the denominator.

Examples.

1. What is the $\frac{4}{5}$ of 2l. 6s.

```
 2l.  6s.
       4
 -------
5)9   4
 -------
Anſ. 1l. 16s. 9d. 2 3/5 qrs.
```

2. Required the value of $\frac{2}{3}$ of 2 l.

```
  20
 ----
3)40(13s. 4d. Anſ.
 ----
    1
   12
 ----
   12(4d.
```

Rule VIII. *To reduce fractions to other equivalent ones of a different integer; a certain number of the leſs integers being contained in one of the greater.* Conſider how many of the leſs integer make one of the greater; and by that number multiply the numerator if the reduction be to a leſs integer, or the denominator, if to a greater.

Examples.

Reduce $\frac{2}{9}$l. to the fraction of a ſhilling.

$$\frac{2}{9}\text{l.}=\frac{2\times20}{9}=\frac{40}{9}\text{s.}$$

Reduce $\frac{40}{9}$s. to the fraction of 1l.

$$\frac{40}{9}\text{s.}=\frac{40}{9\times20}\text{l.}=\frac{2}{9}\text{l.}$$

If a compound whole number be propoſed, reduce it all to the loweſt denomination mentioned in it, and proceed as before.

Rule IX. *To reduce fractions to equivalent ones of a different integer, when a certain number of the leſs is not exactly contained in the greater.* 1. By the laſt, reduce the given fraction to an equivalent one of ſuch an integer, of which a certain number are contained in the integer to which the fraction muſt be brought, or which ſhall contain a certain number of this. 2. By the laſt alſo, reduce this fraction to an equivalent one of the integer required.

Example.

Reduce $\frac{2}{7}$ of 1l. ſterling to the fraction of a guinea.

$$\frac{2}{7}\text{l.}=\frac{2\times20}{7}\text{s.}=\frac{2\times20}{7\times21}\text{gui.}=\frac{40}{147}\text{ guinea.}$$

Sect. III. Addition of Vulgar Fractions.

Rule. Reduce compound fractions to ſimple ones, and all to the ſame integer and denominator if they be different; then add all the numerators together, and ſet the ſum over the common denominator, from the ſum of the fractions required. When ſeveral fractions are to be collected, it is commonly beſt firſt to add thoſe two together which moſt eaſily reduce to a common denominator, then their ſum and a third, and ſo on.

Example. What is the ſum of $\frac{5}{8}$, $7\frac{1}{2}$ and $\frac{1}{3}$ of $\frac{3}{4}$?

$\frac{5}{8}+7\frac{1}{2}+\frac{1}{3}$ of $\frac{3}{4}=\frac{5}{8}+7\frac{1}{2}+\frac{1}{4}=\frac{5}{8}+7\frac{4}{8}+\frac{2}{8}=7\frac{11}{8}=8\frac{3}{8}$ the ſum.

Sect. IV. Subtraction of Vulgar Fractions.

Rule. The ſame preparations being made here as in addition, take the difference of the numerators and ſet it over the common denominator, for the difference of the fraction required. In ſubtracting mixt numbers, when the fraction in the ſubtrahend is greater than that in the minuend, ſubtract the numerator of the ſubtrahend from the denominator, and to the difference add the numerator of the minuend; and carry one to the integer in the ſubtrahend.

Examples.

1. What is the difference between $\frac{15}{22}$ and $\frac{11}{17}$?

$$\frac{15}{22}-\frac{11}{17}=\frac{255-242}{17\times 22}=\frac{13}{374}\text{ Anſ.}$$

2. What is the difference between $5\frac{3}{8}$ and $2\frac{7}{11}$?

$$5\tfrac{3}{8}-2\tfrac{7}{11}=5\tfrac{33}{88}-2\tfrac{56}{88}=4\tfrac{121}{88}-2\tfrac{56}{88}=2\tfrac{65}{88}$$

Sect. V. Multiplication of Vulgar Fractions.

Rule. Reduce mixt numbers, if there be any, to fractions; then multiply all the numerators together for the numerator, and multiply all the denominators together for the denominator of the product required. A fraction is beſt multiplied by an integer, by dividing the denominator by it if poſſible, but if that cannot be done, multiply the numerator by it.

Example.

What is the product of $\frac{2}{3}$, $3\frac{1}{4}$, 5, and $\frac{3}{4}$ of $\frac{3}{5}$?

$$\frac{2}{3}\times 3\tfrac{1}{4}\times 5\times\frac{3}{4}\text{ of }\frac{3}{5}=\frac{2\times 13\times 5\times 3\times 3}{3\times 4\times 4\times 5}=\frac{39}{8}=4\tfrac{7}{8}.\quad\text{Anſ.}$$

Sect. VI. Division of Vulgar Fractions.

Rule. Having prepared the terms as in multiplicatiou; take the quotient of the numerators and of the denominators if they will exactly divide, for the numerator and denominator of the fraction required; but if that cannot be done, multiply the dividend by the *Reciprocal* of the diviſor, for the quotient required. By the reciprocal of a fraction, is meant the fraction got by inverting its terms; ſo the reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$, and of 5, or $\frac{5}{1}$ is $\frac{1}{5}$. A fraction is divided by an integer by dividing the numerator by it, if poſſible; but if it will not exactly divide, then multiply the denominator by it.

Examples.

1. What is the quotient of $\frac{25}{9}$ by $\frac{5}{3}$?

$$\frac{25}{9}\div\frac{5}{3}=\frac{25\div 5}{9\div 3}=\frac{5}{5}=1\tfrac{2}{3}.\quad\text{Anſ.}$$

2. What is the quotient of $\frac{5}{9}$ by $\frac{2}{15}$?

$$\frac{5}{9}\div\frac{2}{15}=\frac{5}{9}\times\frac{15}{2}=\frac{5\times\overset{5}{18}}{\underset{3}{9}\times 2}=\frac{25}{6}=4.\ \text{Anſ.}$$

CHAPTER IX.

DECIMAL FRACTIONS.

Sect. I. Definition, Notation, *and* Numeration *of* Decimals.

A decimal is a fraction whoſe denominator is 1 with a cypher or number of cyphers annexed; being always one or more 10th parts, 100dth parts, 1000dth parts, 10,000dth parts, or the like.

The arithmetic of vulgar fractions is tedious, and even intricate to beginners. The difficulty ariſes chiefly from the variety of denominators; for when numbers are divided into different kinds of parts, they cannot be eaſily compared. This conſideration gave riſe to the invention of decimal fractions, where all the units are divided into ſimilar parts, and the diviſions and ſubdiviſions are regulated by the ſame ſcale which is uſed in Arithmetic of Integers. The firſt figure of a decimal fraction ſignifies tenth parts, the 2d hundredth parts, the 3d thouſandth parts, and ſo on.

Decimals are written down without their denominators, the numerators being ſo diſtinguiſhed as to evince what the denominators are; which is done by ſeparating, by a point, ſo many of the right hand figures from the reſt as there are cyphers in the denominator; the figures on the left ſide of the point being integers, and thoſe on the right decimals. Thus $\frac{13}{10}$ is written 1·3, and named 1 and 3 tenths; and $\frac{25}{100}$ is written ·25, and named 25 hundredths or hundredth parts. But if there be not a ſufficient number of figures in the numerator, cyphers are prefixed to ſupply the defect: So $\frac{1}{100}$ is written ·01, that is 1 hundredth; and $\frac{15}{1000}$ thus ·015, that is 15 thouſandths.

The uſe of cyphers in decimals, as well as integers, is to bring the ſignificant figures to their proper places, on which their value depends. As cyphers, when placed on the left hand of an integer, have no ſignification, but when placed on the right hand, increaſe the value ten times each; ſo cyphers, when placed on the right hand of a decimal, have no ſignification; but when placed on the left hand diminiſh the value ten times each.

The notation and numeration of decimals will be ſtill more obvious from the following examples:

4.7	ſignifies	Four and ſeven tenth parts.
.47		Four tenths, part and ſeven hundredth parts, or 47 hundredth parts.
.047		Four hundredth parts, and ſeven thouſandth parts, or 47 thouſandth parts.
.407		Four tenth parts, and ſeven thouſandth parts, or 407 thouſandth parts.
4.07		Four, and ſeven hundredth parts.
4.007		Four, and ſeven thouſandth parts.

The column next the decimal point is ſometimas called *decimal primes*, the next *decimal seconds*; and the next decimal *thirds*, and ſo on.

Sect. II. Addition *and* Subtraction *of* Decimals.

Write the propoſed numbers under each other, according to the value of their places, as in whole numbers; in which order, the decimal points will ſtand directly below each other: then add or ſubtract as in whole numbers, placing a decimal point in the ſum or difference, ſtraight below the other points.

Examples.

169·3	
27·48	
213·97	from 321·9
·04	ſub. 26·481
Sum 410·79	295·419

Sect. III. Multiplication *of* Decimals.

Write down the factors, and multiply exactly as in integers, placing the decimal point to the product, ſo as to make juſt as many decimals in it, as there are in both factors; and if there be not as many figures in the product, as there ought to be decimals, prefix cyphers to ſupply the deficiency.

Examples.

52·3	5·12
2·41	·0098
523	4096
2092	4608
1046	·050176
126043	

Contractions.

When decimals are to be multiplied by 1, with any number of cyphers, it is done by only removing the decimal point ſo many places farther to the right hand, as there are cyphers in the multiplier, and ſubjoining cyphers, if need be.

Example.

The product of 51·3 and 1000 is 51300·0.

When the product will contain many more decimals than are neceſſary for the preſent purpoſe, the work may be contracted thus.—Write the units figure of the multiplier ſtraight under ſuch decimal place of the multiplicand, as the laſt of the product is intended to be, writing the other figures of the multiplier in an inverted order; then, in multiplying, reject all the figures in the multiplicand, which are on the right of the multiplying figures; writing the products down ſo, that their right hand figures fall ſtraight below each other; and carrying to ſuch right hand figures from the product of the two preceding figures in the multiplicand thus, viz. 1 from 5 to 15, 2 from 15 to 25, 3 from 25 to 35, &c. and the ſum of the lines will be the product to the number of decimals required, and will be ſeldom wrong in the laſt figure.

Example.

Multiply 27·14986 by 92·41035, ſo as to retain only four places of decimals in the product.

Contracted.	*Common way.*	
27·14986	27·14986	
53014·29	92·41035	
24434874	13	574930
542997	81	44958
108599	2714	986
2715	108599	44
81	542997	2
14	24434874	
2508·9280	2508·9280	650510

Sect. IV. Division *of* Decimals.

Divide as in integers; and to know how many decimals muſt be in the quotient, obſerve the following rules:

Rule I. The firſt figure of the quotient muſt poſſeſs the ſame place of decimals or integers, as doth that figure of the dividend which ſtands over the units place of the firſt product.

Rule II. The decimal places of the diviſor and quotient together, muſt be equal in number to thoſe of the dividend. Whence, if the number of decimals in the diviſor be taken from the number in the dividend, the remainder will be the number in the quotient. If, in any caſe, there be a remainder, after all the dividend figures are uſed, the quotient may be continued to any number of decimals by ſubjoining a cypher continually to the laſt remainder. And whenever the number of figures in the quotient is leſs than the required number of decimals, prefix cyphers to ſupply the defect.

Example.

52·3)73·743(1·41
·016)5·040(·315
13·5)·2430(·018

Contractions.

When the number of figures in the diviſor is great, the diviſion at large will be very troubleſome, but may be contracted thus: Having by the firſt general rule found what place of decimals or integers the firſt figure of the quotient will poſſeſs; conſider how many figures of the quotient will ſerve the preſent purpoſe; then take the ſame number of the left hand figures of the diviſor, and as many of the dividend figures as will contain them (leſs than 10 times); by theſe find the firſt figure of the quotient, and for each following figure, divide the laſt remainder by the diviſor, wanting one figure to the right, more than before, but obſerving what muſt be carried to the firſt product, for ſuch omitted figures, as in the ſecond contraction of multiplication; and continue the operation till the diviſor is exhauſted. When there are not as many figures in the diviſor as are required to be in the quotient, begin the diviſion with all the figures as uſual, and continue it, till the number of figures in the diviſor, and thoſe remaining to be found in the quotient, be equal, after which, uſe the contraction.

Example.

Divide 2508·92806 by 92·4103,5, ſo as to have four decimals in the quotient, in which caſe, the quotient will contain ſix figuees.

Common way.

92·4103,5)2508·928,06(27·1498
66072106
13848610
46075750
91116100
79467850
5539570

Contracted.

92·4103,5)2508·928,06(27·1498
660721
13849
4608
912
80
6

Sect. V. Reduction *of* Decimals.

Rule I. *To reduce a vulgar fraction to an equivalent decimal.* Divide the numerator by the denominator, as in diviſion of decimals, and the quotient will be the decimal required.

Examples.

$\frac{3}{8} = \cdot375$ $\frac{12}{75} = \cdot16$ $\frac{3}{67} = \cdot04477$

Rule II. *To reduce a decimal of a ſuperior denomination to its value in the inferior ones.* Multiply the given decimals by ſuch a number as will reduce it to the next inferior name, and point off in the product as many places of decimals as are in the given number; then reduce theſe in the ſame manner to the next name; and ſo continue the reduction to the loweſt name required, or till the decimals pointed off be all cyphers; then the numbers on the left of the points will expreſs the value of the decimal.

Example.

What is the value of ·775 of £. 1.

·775

20

sh. 15·500

12

d. 6·000

Rule III. *To reduce integers or decimals to equivalent decimals of ſuperior denominations.*

Case I. If a ſimple number or decimal be propoſed, reduce it to the name required, by dividing as in reduction of integers.

Example.

Reduce 9 d. to the decimal of a pound.

12)9·00

20)·7500

·0375

Case II. A compound number may be reduced to a ſuperior name, by reducing each of its parts, and taking the ſum of the decimals; the beſt way to do which is this: Write the given numbers under each other, proceeding orderly from the leaſt to the greateſt name, for dividends; draw a perpendicular line on the left of theſe, and on the left of it write oppoſite to each dividend ſuch a number, for a diviſor, as will reduce it to the next ſuperior name; then begin with the upper diviſion, and affix the quotient of each to the next dividend, as a decimal part of it, before it be divided, and the laſt ſum will be the anſwer.

Example.

Reduce £. 3 : 12 : 6¾d. to the denomination of pounds.

4	3
12	6·75
20	12·5625
	3·628125 Anſ.

CHAPTER X.

INTEREST.

Sect. I. Definitions.

Intereſt is the premium allowed for the loan of money.

The ſum lent is called the principal. The ſum of the principal and intereſt is called the amount.

Intereſt is allowed at ſo much *per cent. per annum*, which premium, *per cent. per annum*, or intereſt of £. 100 for a year, is called the rate of intereſt.

Intereſt is of two ſorts, simple and compound.

Sect. II. Simple Interest.

Simple Intereſt is that which is allowed for the principal lent only.

Rule I. *To* find *the* intereſt *for* a year, multiply the principal by the rate, and divide the product by 100.

II. *To* find *the* intereſt *for* ſeveral years, multiply the intereſt of one year by the number of them.

III. *To* find *the* intereſt *for* any parts *of* a year, *as* ½, ¼, *&c.* take the ſame proportional parts of one year's intereſt.

IV. *For* any number *of* days, multiply the intereſt of a year by them, and divide by 365.

Example.

What is the intereſt of £. 225, 10s. for 6¼ years, at 4½ *per cent. per annum?*

225·5 principal

4·5 rate

100)1014·75

10·1475 intereſt for a year

6

60·8850 intereſt for 6 years

2·536875 intereſt for ¼ year

63.421875

or £. 63 : 8 : 5¼d. the intereſt required.

The above rules for ſimple intereſt ſerve alſo to calculate *Commiſſion*, *Brokage*, *Inſurance*, the *Stocks*, or any thing elſe rated at ſo much *per cent.*

Sect. III. Compound Interest.

Compound intereſt is that which is allowed, not only for the ſum lent, but alſo for its intereſt; as it becomes due at the end of each ſtated time of payment.

Rule. Find the amount of the given principal for the time of the firſt payment, by ſimple intereſt; then conſider this amount as the principal for the ſecond payment, whoſe amount calculate in the ſame manner; and ſo on through all the payments, ſtill accounting the laſt amount as the principal of the next payment.

Example.

What will £. 50 amount to in 3 years, at 5 *per cent. per annum*, compound intereſt?

To 50 principal
add 2·5 intereſt for 1 year.

52·5 principal for ſecond payment
2·625 intereſt

55·125 principal for third payment
2·75625 intereſt.

$$\left.\begin{array}{r}57\cdot88125\\ \text{or £. }57:17:7\tfrac{1}{2}\text{d.}\end{array}\right\}\text{ amount required.}$$

In calculating compound intereſt for *parts of times*, ſome authors, for expedition, calculate for a complete time, and then take a part of the reſult proportionate to the part of the time; but this is not juſt, as the compound intereſt does not increaſe in the early period exactly in proportion to its increaſe in the late or complete period. In all ſuch calculations therefore, where it is neceſſary to calculate compound intereſt, for parts of times, the moſt expeditious and accurate method is by **Logarithms**; for though it is poſſible to make ſuch calculations without them, the trouble is immenſe; whereas, by logarithms it is as eaſy to perform the calculations with parts of times of payment, as with whole ones.

Sect. IV. Diſcount.

Discount or **rebate** is the difference between a ſum of money due at a certain time to come, and its preſent worth. The **preſent value** of any ſum or debt, due ſome time hence, is ſuch a ſum, as if put to intereſt, would in the time and at the rate for which the diſcount is to be made, amount to the ſum or debt then due.

Rule. As the amount of 100 l. for the given rate and time, is to the given ſum or debt, ſo is 100 l. or the intereſt of 100 for the given time to the preſent worth, or to the diſcount of the given ſum, reſpectively.

The method uſed among bankers in diſcounting bills is to find the intereſt of the ſum drawn for, from the time the bill is diſcounted, to the time when it becomes due, (including the days of grace) which intereſt they reckon as the diſcount, thereby making the diſcount more than it really is. But when goods are bought or ſold, and diſcount is to be made for preſent payment, at any rate per cent. without regard to time, the intereſt of the ſum as calculated for a year is the diſcount.

Example. What is the preſent worth of 700l, due 9 months hence, diſcount at 5 per cent. per annum?

100
3·75 int. for 9 months.

103·75 amount of £. 100

£. £. £.
103·75 : 700 : : 100
100

103·75)70000(674·6988
or £. 674. 13s. 11d.
preſent worth ſought.

Sect. V. Equation of Payments.

Equation of payments is the finding a time, when if a ſum of money be paid which is equal to the ſum of ſeveral others due at different times, no loſs will be ſuſtained by either party.

Rule. Multiply each payment by the time it is due at, then dividing the ſum of the products by the ſum of the payments, the quotient is the equal time.

Ex. A debt of £. 60 is to be paid, £. 30 at 2 months, and £. 30 at 4 months: but if it be reduced to one payment, at what time muſt it be paid?

£.
2 × 30 = 60
4 × 30 = 120

60) 180(3 months, the time required.
180

CHAPTER XI.

COMMERCIAL ARITHMETIC.

Introduction.

Although every branch of arithmetic might come under the title **Commercial**, as the whole ſcience is more or leſs applicable to commerce or merchandize, yet under this head we mean only to comprehend thoſe **Rules** of arithmetic, (as they are commonly called) not yet taken notice of, which are generally inſerted in practical treatiſes on this ſcience; but which could not with propriety be introduced in the preceding parts, and which do not properly come under the articles **Algebra**, **Book keeping**, **Geometry** or **Logarithms**.

Sect. I. Single Fellowſhip.

Single Fellowſhip is a rule by which any ſum or quantity may be divided into any aſſigned number of parts, which ſhall be proportional to ſo many other propoſed numbers, each to each. By this rule are adjuſted the gain or loſs, or charges of merchants in company, the effects of bankrupts, legacies in caſe of a deficiency of aſſets, &c.

Rule. Make the ſum of the numbers, to which the required parts muſt be proportional, the firſt term; the quantity to be parted or divided, the ſecond; and each of the given numbers, to which the required ones muſt be proportional, the ſeveral third terms, of ſo many rule of three queſtions; the fourth terms of which will be the reſpective parts required.

Ex. Two merchants, A and B, trade together: A puts into the ſtock £. 60. and B puts in £. 40. They gain by trading £. 24. What are their ſhares of it?

60
40

$$100:24\left\{\begin{array}{lrrl} & \text{£.} & \text{s.} & \\ ::60: & 14 & 8 & \text{A's ſhare.}\\ ::40: & 9 & 12 & \text{B's ſhare.}\end{array}\right.$$

Proof, 24

Sct. II. Double Fellowſhip.

When the ſhares of partners are continued in company unequal times, they occaſion the name *fellowship with time*, or *double fellowship* : which is performed by the following

Rule. Multiply each ſhare by the time of its continuance ; then divide the gain or loſs in proportion to the products, as in ſingle fellowſhip, by ſaying, as the ſum of the products is to the whole gain or loſs, ſo is each product, to each part of it.

Ex. A had in company £. 50 for 4 months, and B £. 60 for 5 months, at the end of which time, they gained £. 24. How muſt it be divided between them ?

4 × 50=200
5 × 60=300

			£.	s.	
500 : 24	: :	200 :	9	12	A's ſhare.
	: :	300 :	14	8	B's ſhare.
		Proof,	24		

Sect. III. Barter.

Barter is the exchanging of commodities ; and as neither party is ſuppoſed to ſuſtain any loſs, when the commodities exchanged are not of equal value, the defect is ſupplied with money, &c.

Case I. When the quantity of one commodity is given, with its value, or that of its integer ; as alſo the value of the integer, or rate of ſelling ſome other commodity to be given for it, to find the quantity of this ; or having the quantity of the latter given, to find the rate of ſelling it. If the amount of the given quantity be unknown, calculate it in the ſhorteſt manner you can, from the given value of its integer ; then find how much of the other quantity this amount will purchaſe, at the given rate of ſelling it ; or if the quantity be given, from thence find the rate of ſelling it.

Case II. If the quantities of both commodities, with the rate of ſelling them, be given ; to find what quantity of ſome other commodity or money muſt be given in caſe of an inequality of the amount of the firſt commodities. Calculate the amount of each of the two given commodities ; then their difference is the money, or amount of the third commodity to be advanced ; whoſe quantity, from thence and its rate is eaſily found.

Case III. When, in bartering, one commodity is rated above the ready-money price ; to find the quantity and bartering price of the other commodity. As the ready money price of the one is to its bartering price, ſo is that of the other to its barter price ; then the quantity of the latter commodity may be found either from the ready money or bartering prices.

Theſe are the moſt general caſes in barter, and ſuch queſtions as are not contained in them, are eaſily reſolved from a little conſideration of their nature.

Sect. IV. Loss *and* Gain.

Queſtions in this rule are ſuch whoſe ſolutions determine the loss or gain upon commodities ; of which queſtions there is a great variety ; but they may be all eaſily ſolved from a little conſideration and the following proportion, viz. That the *gains* or *losses* are in proportion as the *quantities* of goods, &c.

Sect. V. Exchange.

I. Exchange is the bartering of money and conſiſts in finding what quantity of money of one place is given for a ſpecified ſum of another, according to a given courſe of exchange.

II. The courſe of Exchange is ſuch a valuable ſum of the money of one place, as is propoſed to be given for a certain conſtant ſum of that of another.

III. The par of exchange is the intrinſic equality between two pieces or ſums of money, one of which is the conſtant price or ſum, to which the courſe is compared.

Note. The Par of Exchange between the United States of America and moſt other trading countries may be aſcertained by the table of coins, &c. which we have already given.

IV. The agio is the difference at Amſterdam and ſome other places in Europe, between the bank and current money and is generally rated from 3 to 6 per cent.

The operations are all performed by the rule of three, practice, &c.

1ſt. *Reduce the currencies of the different states in America into one another.*

And here it is neceſſary to obſerve, that four different currencies or rates, at which any one ſpecies of coin of the ſame value, is reckoned in the denominations of account, have, perhaps, from the firſt ſettlement of America, been, and ſtill continue to be uſed in different parts of the union. In the New England States, viz. New-Hampſhire, Maſſachuſetts, Rhode-Iſland, and Connecticut, in Vermont, Virginia and Kentucky, the dollar is reckoned at 6 ſhillings ; in New-York, and North-Carolina, at 8 ſhillings ; in New-Jerſey, Pennſylvania, Delaware and Maryland, at 7 ſhillings and 6 pence ; and in South-Carolina and Georgia, at 4 ſhillings and eight pence.

Conceiving, that in an extenſive and commercial nation like this, the trade and intercourſe of one extremity with another, will frequently render it neceſſary to reduce the currency of the one into that of the other, we have framed the following

Rules for reducing the currencies of the different ſtates to a par with each other ; as alſo for reducing the money of account of the United States to thoſe currencies and vice verſa by decimals.

I. To reduce New-England, &c. to New-York and North-Carolina currency ; to any given ſum add its third part ; and vice verſa, ſubtract a fourth.

Examples.

1ſt. In £. 326 12 6 New-Hampſhire currency, how much in New-York and North-Carolina.

3)326 12 6
108 17 6
435 10 0 Anſwer.

2d. In 435 10 New-York currency, how much New-Hampſhire.

4)435 10
108 17 6
326 12 6 Anſwer.

II. To reduce New-England, &c. to New-Jerſey currency; add to any given ſum its fourth part; and vice verſa, ſubtract a fifth part.

EXAMPLES.

1ſt. In £. 100 New-Hampſhire currency, how much New-Jerſey.

4)100
25

125 Anſwer.

2d. In £. 125 New-Jerſey currency, how much New-Hampſhire.

5)125
25

100 Anſwer.

III. To reduce New-England, &c. to South-Carolina and Georgia currency, as 9 to 7, or ſubtract $\frac{2}{9}$ and vice verſa as 7 to 9, ſo is the one currency to the other: or add ^{7}

1ſt. In £. 420 12 5 New-England currency, how much Georgia currency.

420 12 5
7

9)2944 6 11
327 2 $11\frac{1}{4}$ Anſwer.

Or thus:

9)420 12 5
46 14 $8\frac{1}{2}$

373 17 $8\frac{1}{2}$
46 14 $8\frac{1}{2}$

327 3 $0\frac{1}{2}$ Anſwer.

EXAMPLES.

1ſt. In £. 327 2 $11\frac{1}{2}$ South-Carolina currency, how much Maſſachuſetts.

327 2 $11\frac{1}{2}$
9

7)2944 6 $11\frac{1}{2}$
420 12 5 Anſwer.

Or thus:

7)327 2 $11\frac{1}{2}$
46 14 $8\frac{1}{2}$
46 14 $8\frac{1}{2}$

420 12 $5\frac{1}{2}$ Anſwer.

IV. To reduce New-York and North-Carolina currency to New-Jerſey, &c. deduct $\frac{1}{16}$ and vice verſa add $\frac{1}{15}$.

EXAMPLES.

1ſt. In £. 100 New-York, how much in New-Jerſey currency.

16=4×4(100

4)25
6 5

93 15 Anſwer.

2d. In £. 93 15 New-Jerſey currency, how much N York.

15=3×5 3)93 15

5)31 5
6 5

100 0 Anſwer.

V. To reduce New-York and North Carolina, to So Carolina and Georgia currency; as 12 to 7, and vice ve as 7 to 12, ſo is the one to the other.

EXAMPLE I. £.171 8 7 New-York, how much Geor currency?

171 8 7
7

12)1200 0 1
100 0 0 Anſwer.

EXAMPLE II. In £.100 South Carolina money, h much New-York?

100
12

7)1200
171 8 $6\frac{6}{7}$ Anſwer.

VI. To reduce New-Jerſey, &c. to South Carolina c rency, as 45 to 28; and vice verſa, as 28 to 45, ſo is one currency to the other.

EXAMPLE I. In £.160 14 $3\frac{1}{4}$ New-Jerſey money, h much South Carolina, &c.

160 14 $3\frac{1}{4}$
23=4×7 4

642 17 2
7

45=5×9 5)4500 0 2
9)900 0 0
100 0 0 Anſwer.

EXAMPLE II. In £.100 Georgia currency, how mu New-Jerſey?

100
45=9×5 9

900
5

28=7×4 7)4500
4) 642 17 $1\frac{5}{7}$
160 14 $3\frac{1}{2}$ Anſwer.

VII. To reduce either of the above currencies to th money of account of the United States, let the inferi denominations, if any, in the given ſums be annexed t the pounds in decimals, and divide, if the rate of the dol lar be 6 ſhillings by .3: if 8 ſhillings .4: if 7 ſhil lings and 6 pence by .375: if 4 pence b .23: and pointing off the deci to r figures to left will be dollars, t of a dollars or cents and mills. account of the United States currencies, multiply reſpectively by the decimals, by which in the former caſe, it was directed to divide and the product will be pounds and decimals of a pound.

EXAMPLES.

1ſt. In £. 900 10 Rhode-Iſland, how many dollars ?
.3)900.50
3001.66 or 3001 dollars and 66 cents anſ.

2d. In £. 736. 12. 6. New-York currency, how much federal money ?
.4)736.625
1841.56¼ or 1841 dollars and 56¼ cents anſ.

3d. In £. 1224. 7. 6 Pennſylvania currency, how many dollars.
.375)1224.375(3265
1125
993
750
2437
2250
1875
1875
0

4th. In 3001 dollars and 66 cents, how much Rhode-Iſland currency ?
3001.66
.3
900.498 or 900. 10 anſ.

5th. In 1841 dollars and 56 cents, how much New-York currency ?
1841.56
.4
736.624 or 736. 12. anſ.

6th. In 3265 dollars, how many pounds Pennſylvania currency? 3265
375
16325
22855
9795
1224.375 or £. 1224: 7: 6 anſ.

II. To reduce any ſum of Britiſh ſterling into the money of the United States, multiply by 4. 44. and the product will be the anſwer, in dollars and cents. Again to bring any number of dollars into Britiſh ſterling, divide by 4. 44.

EXAMPLES.

1ſt. In £. 2564 ſterling, how much federal money ?
2564
4.44
10256
10256
10256
11384. 16 or 11384 dollars & 16 cents.

2d. In 11384 dollars and 16 cents, how much ſterling money ?
4.44)11384. 16(2564 ſterling anſ.
888
2504
2220
2841
2664
1776
1776
0

The reaſon of the above rule is manifeſt; a pound ſterling being equal to 4. 44 dollars, or 4 dollars and 44 cents.

TO REDUCE ENGLISH MONEY.

1ſt. *To New-England and Virginia currency;* to the Engliſh add one third, and vice verſa, to bring New-England currency to Engliſh money, ſubtract one fourth.

EXAMPLES.

1ſt. In £. 100 ſterling, how much Virginia currency ?
3)100
33. 6. 8
133. 6. 8 anſ.

In £. 133. 6. 8 New-Hampſhire currency, how much Britiſh ſterling ?
4)133. 6. 8
33. 6. 8
100. 0. 0 anſ.

2d. *To New-Jerſey, Pennſylvania, Delaware and Maryland currency.* Multiply the Engliſh money by 5, and divide the product by 3, and vice verſa to bring New-Jerſey, &c. money into Britiſh ſterling, multiply by 3 and divide by 5.

EXAMPLES.

1ſt. In £. 100 ſterling, how much New-Jerſey, &c. currency ?
100
5
3)500
166. 13. 4 anſ.

2d. In £. 166 13 4 New-Jerſey currency, how much Britiſh ſterling ?
166. 13. 4
3
5)500. 0. 0
100 anſ.

3d. *To New-York and North-Carolina currency.* Multiply the Engliſh money by 16, and divide by 9, and vice verſa to reduce New-York currency into Britiſh ſterling, multiply by 9 and divide by 16.

Example.

1. In £. 100 ſterling, how much New-York currency?

100
4×4=16

400
4

9)1600

177 15 $6\frac{2}{3}$ anſ.

2. In £. 177 15 $6\frac{2}{3}$ New-York currency, how much ſterling?

177 15 $6\frac{2}{3}$
9

16)1600 0 0

100 anſ.

4th. *To South-Carolina and Georgia currency.* To the Engliſh money add one twenty ſeventh, and vice verſa, to bring South-Carolina currency into ſterling, ſubtract one twenty eight.

Example.

1. In £. 100 ſterling, how much South-Carolina currency?

27=3×9)100

3)11 2 $2\frac{2}{3}$

+3 14 $0\frac{8}{9}$

103 14 $0\frac{8}{9}$ anſ.

2. In £. 103 14 0^{8} South-Carolina currency, how much ſterling?

28=4×7)103 16 $0\frac{8}{9}$
4)14 16 3

—3 14 $0\frac{8}{9}$

106 anſ.

The following general rules will direct the attentive ſtudent in all computations, reſpecting the compariſon of monies.

1ſt. Reduce the given ſum (if neceſſary) to that kind of money, by which exchange is computed.

2d. Reduce this according to the given rate of exchange, into the correſponding money of the other country.

3d. Reduce the exchange money thus found (if neceſſary) to the kind of money required.

We ſhall illuſtrate theſe rules by a few examples.

Batavian Republic.

Accompts are generally kept there in florins or guilders, ſtivers and peningens.

			D.	Cts.
8 Pennings	=	1 Grote		1
2 Grotes	=	1 Stiver		2
6 Stivers	=	1 Schilling		12
20 Stivers	=	1 Guilder		40
$2\frac{1}{2}$ Guilders	=	1 Rix Dollar	1	0
2 Guilders	=	1 Dollar		80
6 Guilders	=	1 £ Flemiſh	2	40

Example.

1ſt. In 10235 guilders, 17 ſtivers 8 peningens, how much federal money, at 40 cents per guilder?

10235
1 Guilder 40 cents

409400
17 Stivers 34 cents
8 Peningens 1 cent

409435 or 4094 dols. and 35 cts.

Hamburgh.

They keep their accounts at Hamburgh in marks and ſchillings lubs.

			D	Cts.
2 Deniers gros	=	1 Schilling lub		$2\frac{1}{12}$
6 Schilling lubs	=	1 Schilling gros		$12\frac{1}{2}$
16 Schilling lubs	=	1 Mark		$33\frac{1}{3}$
2 Marks	=	1 Hamburg dol		$66\frac{2}{3}$
3 Marks	=	1 Rix dol	1	
$7\frac{1}{2}$ Marks	=	1 Livre gros or £. Flemiſh	2	50

Note. The pound Flemiſh at Hamburg or Livre gros is the ſame as the pound New-York currency.

Example. In 3765 marks, 12 ſchilling lubs, how many dollars?

1 mark is $33\frac{1}{3}$ cents=$\frac{1}{3}$ of a dol. 3)3765 12
1255. 25 $2\frac{1}{12}$

25

or 1255 dollars and 25 cents anſ.

FRANCE.

The French accounts were formerly kept in livres, ſols and deniers; although it is not improbable that ſome change may take place in that reſpect, in conſequence of the revolution.

			D.	Cts.
12 deniers	=	1 ſol		$\frac{11}{12}$
20 ſols	=	1 livre		$18\frac{1}{3}$
3 livres	=	1 ecu of exchange		55
6 livres	=	1 ecu	1	10

The livres are imaginary money, but the crowns, ſols and deniers are real.

The term tournois, which we find frequently annexed to French money, is only a mark of diſtinction, as ſterling is of the Engliſh.

Examples.

In 9898 Ecus, how many dollars?

9898
110 cents = 1 ecu.

10887,80 or 10887 dols. 80 cents.

To reduce livres into dollars, multiply the livres by 4, and divide the product by 21: the quotient will be the anſwer in dollars, and vice verſa, to bring dollars into livres.

In 1000 livres, how many dollars?

```
     1000
        4
     ----
  21)4000(190·47 or 190 dols. and 47 cents.
     21
     ----
     190
     189
     ----
       10
       10
     ----
   21)100(47
       84
      ----
      160
      147
      ----
       13
```

SPAIN.

Accounts are kept in Spain in piaſtres, rials and marvadies.

			D.	Cts.
2 marvadies	=	1 quartil		$\frac{10}{17}$
34 marvadies velon	=	1 rial velon		5
34 marvadies plate	=	1 rial plate		10
8 rials plate	=	1 piaſtre		80
10 rials plate	=	1 dollar	1	0
4 piaſtres	=	1 piſtole of exchange	3	20
5 piaſtres	=	1 piſtole	4	0

Examples.

How much federal money in 5610 rials plate?

```
        5680
          10 cents = a rial plate.
        ----
  1(00 )568(00
        568 dollars, anſwer.
```

How many dollars in 2760 piſtoles of exchange, 2 piaſtres, 6 rials plate?

```
                 2760
                  320 value of a piſtole of exchange.
               ------
                55200
                8280
              -------
              8832.00
2 piaſtres       1.60
6 rial plate       50
              -------
              8834.20
```

Examples of exchange with other countries might be given, but as they are founded on the ſame principles of computation, it would be ſuperfluous to enumerate them.

SECT. VI. ARBITRATION OF EXCHANGES.

As the courſe or rate of exchange between one nation and another, is almoſt continually varying, either by riſing or falling, from the variations in the circumſtances and balance of trade; ſo the deſign of arbitration is to remit or draw upon foreign places in ſuch a manner, as ſhall turn out the moſt profitable.

Arbitration is generally divided into two parts, SIMPLE and COMPOUND.

I. SIMPLE ARBITRATION.

In ſimple arbitration, the exchanges among three places only are concerned. The PAR *of* ARBITRATION, *or* ARBITRATED PRICE, is ſuch a rate of exchange between two places, as ſhall be in proportion with the rates aſſigned between each of them and a third place. After this par of arbitration is computed, by comparing it with the preſent courſe of exchange, a perſon can judge which way to remit or draw to the moſt advantage, and determine what the advantage ſhall be.

Ex. The exchange between London and Amſterdam being 33s. 9d. per pound ſterling, and the exchange between London and Paris 32d per crown; the par of arbitration between Amſterdam and Paris is required?

ANSWER. By reduction 1*l.* ſter. = 240d. ſter. and 33s. 9d. flem. = 404d. flem.

d. ſter. d. flem. d. ſter. d. flem.
Then 240 : 404 : : 32 : 54

The par of arbitration therefore, between Amſterdam and Paris is 54d. flem. per crown.

II. COMPOUND ARBITRATION.

Compound arbitration reſpects the caſes in which the exchanges between three, four, or more places are concerned.

A perſon who knows at what rate he can draw or remit directly, and alſo hath advice of the courſe of exchange in foreign places, may trace out a path for circulating his money, through more or fewer of ſuch places, and alſo in ſuch order, as to make a benefit of his ſkill and credit: and herein lies the great art of ſuch negociations.

But to determine in what order, and through how many places to circulate a bill, no general rule can be given, as it depends entirely upon a perſon's judgment, and a cloſe attention to the reſults of former caſes of the like kind. The following rules, however, may aſſiſt in determining, whether a direct or an aſſigned circular draft be preferable.

RULE I. Diſtinguiſh the given rates or prices in the circular courſe, into antecedents and conſequents; and place the antecedents in one column, and the conſequents in another, on the right, fronting one another, by way of equation. And in this diſtribution into antecedents and conſequents, each conſequent muſt be of the ſame kind with the next antecedent, and the firſt antecedent of the ſame kind with the laſt conſequent, which muſt be the ſum whoſe value in exchange is required.

II. Multiply the antecedents continually for a diviſor, and the conſequents continually for a dividend; and the quotient of the products will be the value of the ſum required by ſuch exchange.

III. Then compute its value by the direct exchange, or by any other circular exchange, and by comparing the values together you will perceive the moſt advantageous method.

EXAMP. If London would remit 1000*l.* ſterling to Spain, the direct exchange being 42½d. per piaſtre of 272 mervadies, it is required whether will be more profitable, the direct remittance, or by remitting firſt to Holland, at 35s. per £. thence to France, at 58d. per crown; thence to Venice, at 100 crowns per 60 ducats; and thence to Spain, at 360 mervadies per ducat.

ANTECEDENTS.		CONSEQUENTS.
1*l.* Sterling	=	35s. or 430d. Flemiſh
58d. Flemiſh	=	1 crown
100 crowns	=	60 ducats
1 ducat	=	360 mervadies
272 mervadies	=	1 piaſtre
How many piaſtres	=	1000*l.*

Then $\frac{420\times60\times360\times1000}{58\times100\times272}=\frac{210\times30\times45\times10}{29\times17}=\frac{283500}{493}=$ $5750\frac{210}{493}$ piaſtres = the value of 1000*l.* by the circular exchange.

But 42½d. : 1 piaſtre : : 1000*l.* or 240000d. : $\frac{480000}{85}=\frac{96000}{17}=5647\frac{1}{17}$ piaſtres, the value by the direct exchange.

Thus it is plain that the circular exchange is the moſt advantageous, as it produces $103\frac{13}{29}$ piaſtres more than the other.

SECT. VII. ALLIGATION.

Alligation is the method of mixing together ſeveral ſimples of different qualities, ſo that the compoſition may be of a middle quality: and it is commonly diſtinguiſhed into two principal caſes, denominated *alligation medial,* and *alligation alternate.*

CASE I. ALLIGATION MEDIAL.

Alligation medial is the method of finding the rate of the compound, from having the rates and quantities of the ſeveral ſimples given.

RULE. Multiply each quantity by its rate; then divide the ſum of the products, by the ſum of the quantities, or the whole compoſition; and the quotient will be the rate of the compound required.

Ex. A compoſition being made of 5℔ of tea at 7s. per ℔, 9℔ at 8s. 6d. per ℔, and 14℔ at 5s. 10d. per ℔; what is a ℔ of it worth?

s.	*d.*				*l.*	*s.*	
7	—	×	5	=	1	15	—
8	6	×	9	=	3	16	6
5	10	×	14	=	4	1	8

28)9 13 2(—6s. 10d. per ℔. *Ans.*

CASE II. ALLIGATION ALTERNATE.

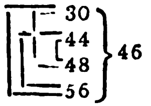
Alligation alternate is the method of finding what quantity of each of the ſimples, whoſe rates are given, will compoſe a mixture of a given rate; ſo that it is the reverſe of alligation medial, and may therefore be proved by it.

RULE 1. Write the rates of the ſimples in a column under each other. 2. Connect, or link with a continued line, the rate of each ſimple which is leſs than that of the compound, with one or any number of thoſe which are greater than the compound; and each greater rate with one or any number of the leſs. 3. Write the difference between the mixture rate and that of the each of ſimples, oppoſite the rates with which theſe are linked. 4. Then if only one difference ſtand againſt any rate, it will be the quantity belonging to that rate; but if there be ſeveral, their ſum will be the quantity.

It appears from the above rule, that many of the queſtions of this caſe will admit of various anſwers each; but from an algebraic proceſs it appears that they will all have infinite varieties of anſwers: After one or more anſwers are found by the rule, a great number more are found by increaſing or decreaſing the quantities in any proportion, or by only increaſing or decreaſing any one or more ſingle pairs of yoke-fellows in any proportion, and leaving the other rates as they are; but that anſwer is commonly deſired which gives the rates in the leaſt integer numbers, and thoſe the neareſt to each other.

EXAMP. How much corn at 2s. 6d. at 3s. 8d. at 4s. and at 4s. 8d. per buſhel, muſt be mixed together, that the compound may be worth 3s. 10d. per buſhel?

Rates.



					s.	*d.*
2	10	12	or 2	at	2	6
2	10	13	or 2	at	3	8
16	2	18	or 3	at	4	0
16	2	18	or 3	at	4	8

Sometimes one or more of the ingredients, and ſometimes the whole compoſition is limited to a certain quantity; which may be divided into the three following caſes or limitations.

LIMITATION I. When the whole compoſition is limited to a certain quantity, and that is not found from the method of linking, and taking the differences; augment or diminiſh the quantity of each ingredient, in the ſame proportion as the given quantity is greater or leſs than the total quantity found from the linking, by ſaying, As the total quantity ſo found, is to the given quantity, ſo is the quantity of each ingredient, found by linking, to the required quantity of each.

LIMITATION II. When one of the ingredients is limited to a certain quantity, and that quantity is not found by the method of linking; either augment, or diminiſh the quantities of all the reſt, in the ſame proportion as the given quantity is greater or leſs than the quantity of the limited ſimple found by linking, by ſtating as in the firſt limitation: or, only augment, or diminiſh in the above proportion, that part of the quantity of the ingredients with which the limited one is linked, which is the difference of the mixture rate and the rate of the limited ſimple, and add the reſulting quantity to the other parts, inſtead of the ſaid difference; keeping the quantities of the other ſimples unaltered.

LIMITATION III. If more than one of the ſimples be limited, find, by Caſe 1, what will be the rate of a mixture made of the given quantities of the limited ſimples only; then conſider this as the rate of a limited ſimple, whoſe quantity is the ſum of the firſt given limited ſimples; from which, and the rates of the limited ſimples, by the ſecond limitation, calculate the quantity of each.

SECT. VIII. ANNUITIES.

An annuity is a ſum of money payable every year for a certain number of years, or for ever.

When the debtor keeps the annuity in his own hands, beyond the time of payment, it is ſaid to be in arrears.

The ſum of all the annuities for the time they have been forborn, together with the intereſt due upon each, is called the amount.

If an annuity is to be bought off, or paid all at once, at the beginning of the firſt year, the price which ought to be given for it is called the preſent worth.

To find the amount of an annuity at ſimple intereſt.

Rule.[*]

1. Find the ſum of the natural ſeries of numbers 1, 2, 3, &c. to the number of years leſs one.

2. Multiply the ſum by one year's intereſt of the annuity, and the product will be the whole intereſt due upon the annuity.

3. To this product add the product of the annuity and time, and the ſum will be the amount ſought.

Examples.

1. What is the amount of an annuity of 700 dollars for 6 years, allowing ſimple intereſt at 7 per cent.?

$1+2+3+4+5=15=3\times5$

49 dollars = 1 year's intereſt.

3

———

147

5

———

735

$4200=700\times6$

———

4935= amount required.

2. What is the amount of an annuity of £. 80 forborn 7 years, allowing 6 per cent. ſimple intereſt?

Ans. £. 677. 12s.

To find the preſent worth of an annuity at ſimple intereſt.

Rule.

Find the preſent worth of each year by itſelf, diſcounting from the time it falls due, and the ſum of all theſe will be the preſent worth required.

Examples.

1. What is the preſent worth of an annuity of £. 100, to continue 5 years, at 6 per cent. per annum, ſimple intereſt?

106 : 100 : : 100 : 94.3396= preſent worth for 1ſt year.
112 : 100 : : 100 : 89.2857= 2d year.
118 : 100 : : 100 : 84.7457= 3d year.
124 : 100 : : 100 : 80.6451= 4th year.
130 : 100 : : 100 : 76.9230= 5th year.

———

425.9391=£.425 18s. 9¼d.=preſent worth of the annuity required.

2. What is the preſent worth of an annuity or penſion of £. 500 to continue 4 years, at 5 per cent. per ann. ſimple intereſt?

Ans. £. 1782 5. 7d.

To find the amount of an annuity at compound intereſt.

Rule 1. Make 1 the firſt term of a geometrical progreſſion, and the amount of £. 1 for 1 year, at the given rate per cent. the ratio.

Rule 2. Carry the ſeries to as many terms as the number of years, and find its ſum.

Rule 3. Multiply the ſum, thus found, by the given annuity, and the product will be the amount ſought.

Examples.

1. What is the amount of an annuity of £. 40 to continue 5 years, allowing 5 per cent. compound intereſt?

$1+1{,}05+1.05^2+1{,}05^3+1{,}05^4=5.52563125$

5.52653125

40

———

22 1,02525000

20

———

,50500000

12

———

6,06000000 Ans. 221 0s. 6d.

2. If £. 50 yearly rent, or annuity, be forborn 7 years, what will it amount to at 4 per cent. per annum, compound intereſt?

Ans. £.395.

To find the preſent value of annuities at compound intereſt.

Rule 1. Divide the annuity by the ratio, or the amount of £. 1 for 1 year, and the quotient will be the preſent worth of 1 year's annuity.

Rule 2. Divide the annuity by the ſquare of the ratio, and the quotient will be the preſent worth of the annuity for 2 years.

Rule. 3. Find, in like manner, the preſent worth of each year by itſelf, and the ſum of all theſe will be the value of the annuity ſought.

Examples.

1. What is the preſent worth of an annuity of £. 40, to continue 5 years, diſcounting at 5 per cent, per annum, compound intereſt?

Ratio=1,05)40.00000(38.095=preſent worth for 1 year.
$1.05^2=$ 1.1025)40.00000(36.281 = ditto for 2 years.
$1.05^3=$1.157525)40.00000(34.556= ditto for 3 years.
$1.05^4=$1.215506)40.00000(32.899 = ditto for 4 years.
$1.05^5=$1.276218)40.00000(31.342 = ditto for 5 years.

———

173.173=£. 173 3s. 5½d.= whole preſent worth of the annuity required.

2. What is the preſent worth of an annuity of £. 21 10s. 9½d. to continue 7 years, at 6 per cent. per annum, compound intereſt?

Ans. £. 120 5s.

To find the preſent worth of a freehold eſtate, or an annuity, to continue for ever, at compound intereſt.

Rule. As the rate per cent. is to £.100, ſo is the yearly rent to the value required.

---

[*] *Whatever the time is, there is upon the firſt year's annuity as many year's intereſt as the whole number of years leſs one; and gradually one leſs upon every ſucceeding year to the laſt but one; upon which there is due only one year's intereſt, and none upon the laſt.*

EXAMPLES.

1. An eſtate brings in yearly £.79 4s. what would it ſell for, allowing the purchaſer 4½ per cent. compound intereſt, for his money?

4,5 : 100 : : 79, 2
100

4,5)7920.0(£.1760 Anſwer.
45

342
315

270
270

0

2. What is the price of a perpetual annuity of £.40, diſcounting at 5 per cent. compound intereſt?

Ans. £.800.

3. What is a freehold eſtate of £.75 a year worth, allowing the buyer 6 per cent. compound intereſt, for his money?

Ans. £.1250.

To find the preſent worth of annuity, or freehold eſtate, in reverſion, at compound intereſt.

RULE 1. Find the preſent worth of the annuity, or freehold as if it were to be entered on immediately.

RULE 2. Find the preſent worth of the laſt preſent worth, diſcounting for the time between the purchaſe and commencement of the annuity, and it will be the anſwer required.

EXAMPLES.

1. The reverſion of a freehold eſtate of £.79 4s. per annum, to commence 7 years hence, is to be ſold; what is it worth in ready money, allowing the purchaſer 4½ per cent. for his money?

4,5 : 100 : : 79, 2
100

4.5)7920.0(£.1760=preſent worth if entered on immediately.
45

342
315

270
270

. . .

and 1.05^7=1,360862)1760.000(1293.297=£.1293 5s. 11¼d.=preſent worth of £.1760 for 7 years, or the whole preſent worth required.

2. Which is moſt advantageous, a term of 15 years in an eſtate of £.100 per annum, or the reverſion of ſuch an eſtate for ever, after the expiration of the ſaid 15 years, computing at the rate of 5 per cent. per annum, compound intereſt?

Ans. The firſt term of 15 years is better than the reverſion for ever afterwards by £. 75 18s. 7½d.

3. Suppoſe I would add 5 years to a running leaſe of 15 years to come, the improved rent being £.186 7s. 6d. per annum; what ought I to pay down for this favour, diſcounting at 4 per cent. per annum, compound intereſt?

Ans. £.460 14s. 1¼d.

[We have deemed it unneceſſary to inſert any of thoſe tables, which are commonly given in Britiſh ſyſtems of Annuities, as each of them being calculated for ſome of the great cities in Europe, will be found, by no means, applicable to the United States. The ſyſtem, which we have here given, is taken from the COLUMBIAN ACCOUNTANT, a work of great merit, written by Mr. *Edward Shepherd*, of New-York, and will, we have no doubt, be found fully ſufficient to ſolve any queſtions, in annuities, which commonly occur in this country.]

SECT. IX. INVOLUTION.

A power is a nnmber produced by multiplying any given number continually by itſelf a certain number of times.

Any number is called the FIRST power of itſelf; if it be multiplied by itſelf, the product is called the *second* power, and ſometimes the ſquare; if this be multiplied by the firſt power again, the product is called the *third* power, and ſometimes the cube; and if this be multiplied by the firſt power again, the product is called the *fourth* power; and ſo on; that is, the power is denominated from the number which exceeds the multiplications by 1.

Thus: 3 is the firſt power of 3.
3 × 3 = 9 is the ſecond power of 3.
3 × 3 × 3 =27 is the third power of 3.
3 × 3 × 3 × 3 =81 is the fourth power of 3.
&c. &c.

Involution is the finding of powers; to do which, from their definition there evidently ariſes RULE. Multiply the given number, or firſt power, continually by itſelf, till the number of multiplications be 1 leſs than the index of the power to be found, and the laſt product will be the power required.

EXAMP. 1. What is the cube of 12·5?

12·5 × 12·5 × 12·5 = 1953· 125 Anſwer.

2. What is the ſquare of $3\frac{2}{5}$ or $\frac{17}{5}$?

$\frac{17}{5} \times \frac{17}{5} = \frac{289}{25} = 11{\cdot}56.$ Anſwer.

SECT. X. EVOLUTION.

The ROOT of any given number, or power, is ſuch a number as being multiplied by itſelf a certain number of times, will produce the power; and it is denominated the firſt, ſecond, third, fourth, &c. root, reſpectively, as the number of multiplications made of it to produce the given power is 0, 1, 2, 3, &c. that is, the name of the root is taken from the number which exceeds the multiplications by 1, like the name of the power in involution.

EVOLUTION is the finding of the roots of numbers, either arithmetically, or in decimals to any propoſed extent.

The power is firſt to be prepared for extraction, or evolution, by dividing it from the place of units, to the left hand in integers, and to the right in decimal fractions, into periods containing each as many places of figures as are denominated

nominated by the index of the root, if the power contain a complete number of ſuch periods: if it do not, the defect will be either on the right hand, or left, or both; if the defect be on the right hand, it may be ſupplied by annexing cyphers, and after this whole periods of cyphers may be annexed to continue the extraction with, if neceſſary; but if there be a defect on the left, ſuch defective period muſt remain unaltered, and is accounted the firſt period of the given number, as if it were complete.

This diviſion may be conveniently made by writing a point over the place of unit, and alſo over the laſt figure of every period on both ſides of it; that is, over every ſecond figure if it be the ſecond root, over every third if it be the third root, &c.

Thus to point this number 21035896·12735; for the ſecond root, it will be $2\dot{1}0\dot{3}5\dot{8}9\dot{6}\cdot1\dot{2}7\dot{3}5\dot{0}$; and for the third root, thus $2\dot{1}03\dot{5}89\dot{6}\cdot12\dot{7}35\dot{0}$.

The root will contain juſt as many places of figures as there are periods or points in the given power; and they will be integers or decimals reſpectively, as the periods are ſo from which they are found, or to which they correſpond, that is, there will be as many integer or decimal figures in the root, as there are periods of integers or decimals in the given number.

To extract the Square Root.

I. Having pointed the given number into periods of two figures each, find a ſquare number either equal to, or the next leſs than the firſt period, which ſubtract from it, and place the root of the ſquare on the right of the given number, after the manner of a quotient in diviſion, for the firſt figure of the root required.

II. To the remainder annex the ſecond for a dividend; and on the left hand of it write the double of the root already found, after the manner of a diviſor.

III. Conſider what figure, which, if annexed to the diviſor, and the reſult multiplied by it, the product may be equal to, or the next leſs than the dividend, as it will be the next figure of the root.

IV. From the dividend ſubtract the product, and to the remainder bring down the next period, for a new dividend: to which as before, find a diviſor by doubling the figures already found in the root; and from theſe find the next figure of the root, as in the laſt article; and continue the operation ſtill in the ſame manner, till all the periods be uſed, or as far as you pleaſe.

When the root is to be extracted to a great number of places, the work may be much abbreviated, thus: having proceeded in the extraction, after the common method, till half the required number of figures in the root is found, the reſt may be found by dividing the laſt remainder by its correſponding diviſor, annexing a cypher to every individual, as in diviſion of decimals; or rather, without annexing cyphers, by omitting continually the right hand figure of the diviſor, after the manner of contractions in diviſion of decimals.

So the operation for the root of 2 to 12 or 13 places, may be thus.

```
     2 ( 1·41421356237 + root
     1
   ------
  24 | 100
   4 |  96
  --------
 281 | 400
   1 | 281
  -----------
 2824 | 11900
    4 | 11296
  -----------
 28282 | 60400
     2 | 56564
  --------------
 282841 | 383600
      1 | 282841
  ------------------
 2328423 | 1007,900 '
       3 |  8485269
  ------------------
 2828426 ) 1590631 ( 56237 +
            176418
              6712
              1055
               206
                 8
```

By means of the ſquare root alſo we readily find the 4th root, or the 8th root, or the 16th root, &c. that is, the root of any power whoſe index is ſome power of the number 2; namely, by extracting ſo often the ſquare root as is denoted by that power of 2; that is, two extractions for the fourth root, three for the 8th root, and ſo on.

To Extract the Cube Root.

I. Having divided the given number into periods of three figures each, find the neareſt leſs cube to the firſt period; ſet its root in the quotient, and ſubtract the ſaid cube from the firſt period; to the remainder bring down the ſecond period, and call this the RESOLVEND.

II. To three times the ſquare of the root, juſt found, add three times the root itſelf, ſetting this one place more to the right than the former, and call this ſum the diviſor. Then divide the reſolvend, wanting the laſt figure, by the diviſor, for the next figure of the root, which annex to the former; calling this laſt figure *e*, and the part of the root before found call *a*.

III. Add together theſe three products, namely, thrice *a* ſquare multiplied by *e*, thrice *a* multiplied by *e* ſquare, and *e* cube, ſetting each of them one place more to the right than the former, and call the ſum the SUBTRAHEND; which muſt not exceed the reſolvend; and if it does, then make the laſt figure *e* leſs, and repeat the operation for finding the ſubtrahend.

IV. From the reſolvend take the ſubtrahend, and to the remainder join the next period of the given number for a new reſolvend; to which form a new diviſor from the whole root now found; and from thence another figure of the root, as directed in article II, &c.

Ex. To extract the cube root of 48228·544.

$$\begin{array}{rl|l}
3\times 3^2 = & 27 & 48228\cdot544\,(\,36\cdot4 \text{ root.} \\
3\times 3 = & 09 & 27 \\
\hline
\text{Diviſor} & 279 & 21228 \text{ reſolvend.}
\end{array}$$

$$\left.\begin{array}{r}
3\times 3^2\times 6 = 162 \\
3\times 3\times 6^2 = 324 \\
6^3 = 216
\end{array}\right\}\text{Add}$$

$$\begin{array}{rr|l}
3\times 36^2 = & 3888 & 19656 \text{ ſubtrahend} \\
3\times 36 = & 108 & \\
\hline
 & 38988 & 1572544 \text{ reſolvend}
\end{array}$$

$$\left.\begin{array}{r}
3\times 36^2\times 4 = 15552 \\
8\times 36\times 4^2 = 1728 \\
4^3 = 64
\end{array}\right\}\text{add}$$

$$\begin{array}{l}
\overline{1572544} \text{ ſubtrahend} \\
\overline{0000000} \text{ remainder}
\end{array}$$

To Extract *any* root whatever.—Let G be the given power or number, *n* the index of the power, find by trials a power nearly equal to the given power or number, and having a rational root. Let this aſſumed power be A and its root *r*, and let R be the required root of G.

Then as the ſum of $n+1$ times A and $n-1$ times G, is to the ſum of $n+1$ times G and $n-1$ times A, ſo as the aſſumed root *r*, to the required root R.

Or, as half the ſaid ſum of $n+1$ times $n-1$ times G, is to the difference between the given and aſſumed powers, ſo is the aſſumed root *r*, to the difference added between the true and aſſumed roots: which difference added or ſubtracted gives the true root nearly.

That is, $\overline{n+1}.\,A+\overline{n-1}.\,G : \overline{n+1}.\,G+\overline{n-1}.\,A :: r : R.$

Or, $\overline{n\times 1}.\tfrac{1}{2}A+\overline{n-1}.\tfrac{1}{2}G : A\backsim G :: r : R\backsim r.$

And the operation may be repeated as often as we pleaſe, by uſing always the laſt found root for the aſſumed root, and the *n*th power for the aſſumed power A.

Ex. To extract the 5th root of 21035·8. Here it appears that the 5th root is between 7·3 and 7.4. Taking 7·3, its 5th power is 20730·71593. Hence we have
$G=21035\cdot8$; $r=7\cdot3$; $n=5$; $\tfrac{1}{2}.\,n+1=3$; $\tfrac{1}{2}.\,n-1=2$.

$$\begin{array}{ll}
A=20730\cdot716 & \\
\overline{G-A=305\cdot084} & \\
A=20730\cdot716 & G=21035\cdot8 \\
3 & 2 \\
\hline
3A=62192\cdot148 & 42071\cdot6 \\
2G=42071\cdot6 &
\end{array}$$

$$\begin{array}{l}
\text{As } \overline{104263\cdot7} : 305\cdot084 :: 7\cdot3 : \cdot0213605 \\
\phantom{\text{As } 104263\cdot7 : 305\cdot0}73 \\
\phantom{\text{As } 104263\cdot7 : }\overline{915252} \\
\phantom{\text{As } 104263\cdot7 :}2135588 \\
\cdot104263\cdot7)\overline{2227\cdot1132}(0213605 \text{ the diff.} \\
14184 \quad 7\cdot3=r \text{ add} \\
3758 \quad \overline{7\cdot321360}=R \text{ the root true to} \\
630 \qquad \text{the laſt figure.} \\
5
\end{array}$$

General Rules *for* extracting *any* root *out of a Vulgar Fraction or Mixt Number.*

I. If the given fraction have a finite root of the kind required, it is beſt to extract the root out of the numerator and denominator, for the terms of the root required.

II. But if the fraction be not a complete power, it may be thrown into a decimal, and then extracted. Or,

II. Take either of the terms of the given fraction for the correſponding term of the root; and for the other term of the root extract the required root of the product, ariſing from the multiplication of ſuch a power of the firſt aſſigned term of the root whoſe index is leſs by 1 than that of the given power, by the other term of the given number. This rule will do when the root is either finite or infinite.

IV. Mixt numbers may be reduced either to improper fractions or decimals, and then extracted.

We ſhall conclude this article of extracting roots, by laying before our readers the following

New and Valuable Theorems *for extracting the* Roots *of* Different Powers, *which were invented by* Josiah Hornblower, *Esq. of Belleville, New-Jerſey, and obligingly transmitted by that gentleman to us.*

Let r=reſolvend, a=the root aſſumed, n=the root firſt found, d=the difference between the root firſt found and the root aſſumed, c=the root corrected, and x=the root ſought.

Then, $\dfrac{\frac{r}{a}+a}{2}=n$ & $-\dfrac{\frac{1}{2}dd}{n}=c$. & $\dfrac{\frac{r}{c}+c}{2}=x$ for the Square Root.

And, $\dfrac{\frac{r}{aa}+2a}{3}=n$ & $-\dfrac{dd}{n}=c$ & $\dfrac{\frac{r}{cc}+2c}{3}=x$ for the cube root.

And, $\dfrac{\frac{r}{a3}+3a}{4}=n$ & $-\dfrac{1\frac{1}{2}dd}{n}=c$ & $\dfrac{\frac{r}{c3}+3c}{4}=x$ for the Biquadrate Root.

And, $\dfrac{\frac{r}{a4}+4a}{5}=n$ & $-\dfrac{2dd}{n}=c$ & $\dfrac{\frac{r}{c4}+4c}{5}=x$ for the Surſolid Root.

And, $\dfrac{\frac{r}{a5}+5a}{6}=n$ & $-\dfrac{2\frac{1}{2}dd}{n}=c$ & $\dfrac{\frac{r}{c5}+5c}{6}=x$ for the Square Cubed, &c. &c. for the reſt.

Although theſe theorems appear complex, they will be found ſimple and eaſy in their application, as will be ſhewn after the following obſervations.

1ſt. The aſſumed root may be either more or leſs than juſt; provided it is the neareſt ſingle root in the firſt period of the reſolvend.

2d. Theſe theorems always give the root ſought too much, which exceſs is corrected by ſubracting from it $\frac{dd}{n}$ as per theorems.

3d. When the root aſſumed is nearly juſt, the remaining figures of the root will be eaſily found to three, four, or five places in the ſquare and cube roots.

4th. If a is equal to the two firſt figures of the root of the reſolvend, they will produce the true root to ſix places, both in the ſquare and cube roots; that is, two figures will give 6; three, 9; four, 12, &c. when corrected by ſubtracting $\frac{dd}{n}$ as per theorem.

5th. It alſo may be obſerved, that when the reſolvends, either the Cube, Surſolid, ſeventh or ninth powers, are not ſurds, the laſt figure of their reſpective roots, are known by the laſt figure, to the right hand of the reſolvends, viz. In the Cube Root, 1 gives 1.) 2 : 8) 3 : 7) 4 : 4) 5 : 5) 6 : 6) 7 : 3) 8 : 2) and 9 : 9, and in the Surſolid the laſt figure in the reſolvend, is always the laſt figure of the root; the ſeventh power is the ſame as the Cube, and the ninth the ſame as the Surſolid, &c.

N. B. The ſecond proceſs for finding x is not uſed, unleſs the reſolvends are ſurds, and their roots are required to many places of figures, as will be ſhewn by the following examples.

EXAMPLE I.

Required, the ſquare root of 788544? Here a is 900, the neareſt root to the firſt period.

Then ÷ 900)788544

876,16

+ 900

÷ 2)1776,16

888,08 $= n$, the root to the 5th figure.

The exceſs corrected, per theorem, $d = 12$, and $\frac{\frac{1}{2}dd}{n}$ is = 0,08, this ſubtracted from n gives 888,00 $= x$.

EXAMPLE II.

Required, the ſquare root of 2490509025? Here $a = 50000$, for the diviſion.

÷ by 50000)2490509025

49810,18

+ a 50000

÷ by 2)99810,18

49905,09 $= n$, then d is 95, and half $\frac{dd}{n}$ is 0,09; this ſubtracted from n leaves 49905,00 $= x$.

Again, let the ſquare root of 145220537353515625 be required. Then by the 4th remark, firſt find the three or four, firſt figures of the root, for the diviſor; thus take the two firſt periods of the reſolvend, viz. 1452 the neareſt root is 4.

4)1452

363

+ 4

÷ 2)763

3811 the diviſor.

Then ÷ by 3811)145220537353515625(381056251

+ 3811

÷ 2)762156251

381078125 $= x$.

EXAMPLES *for the* CUBE ROOT.

The cube root of 9)700227072 required, $a = 900$ by which the reſolvd. is twice divided, thus } 9)77803,008

864,4778

+2a 1800

÷ by 3)2664,477

888,159 $= n$: d is 11,8 and $\frac{dd}{n}$ is 159 to be ſubtracted from n. } ,159

888,000 $= x$.

The cube root of 6)214384046625 required, $a = 6000$; by which divide as before, } 6)35730674

5955,112

+2a is 12000

÷ by 3)17955,112

5985,037 $= n$, here d is 15, and $\frac{dd}{n}$ is 0,037, to be deducted. 0,037

5985,000 $= x$.

Again, let the cube root of 976379602989073960279630298890 be required: then a is 100000000000, therefore you have only to add 2a, to the reſolvend, and divide by 3, which will produce the firſt 4 or 5 figures of the root, which ſquared, becomes the diviſor; thus,

÷ 3)29763796 &c.

9921 $= a$

9921

9921

19842

89289

89289

98426241 $= a^2$)976379602989073960)99199115303

+2 a19842

$= n$ & d is 363 & $\frac{dd}{n}$ is 0013,28 to be ſubtracted from n. } ÷ by 3)297619115303

992063717676

001328

992063716348, $= x$.

EXAMPLES *for the* BIQUADRATE ROOT.

Required the Biquadrate of 9)621801609936 the neareſt root is 900 the diviſor.

9)6908907

9)767656

852,95

+3a 2700

÷ by 4)3552,95

888,23 = n & d is 11,8

and $\frac{1.5dd}{n}$ is 0,23 to be ſubtracted from n.

0,23

888,00 = x.

Required the ſame of 5)620263520360645062 5 the neareſt root is 50000 = a ÷ a 5)124052704 three times

5)24810540

49621,08

+3a 15

÷ by 4)199621,08

49905,27 = n & d is 95,

and $\frac{1.5dd}{n}$ is 0,27 to be deducted from n.

0,27

49905,00 = x.

EXAMPLES *for the* SURSOLID ROOT.

Required the Surſolid root of 6)767928478651799062 5 then a is 6000.

6)7679284786517990625

+ by a four times, 6)1279880,79

thus, 6)21331346

6)3555224

5925,37

+4a is 24000

÷ by 5 29925,07

5985,07 = n d is 15. & $\frac{2dd}{n}$ is 0,07.

ſubtracted. 0,07

5985,00 = x.

What is the Square Cubed Root of 6)4783461771128930664062 5, a is 6000 for the diviſor, viz.

6)4783461771128930664062 5

÷ by a five times 6)797243628

6)132873938

6)22145656

6)3690942

6151,57

+5a 30000

÷ by 6)36151,57

6025,26 = n d is 25.2 & $\frac{2.5dd}{n}$ is ,26 which ſubtract from n.

0,26

6025,00 = x.

Required the 2d Surſolid Root of 218113395661167118 4544453125 a is 8000.

And a^6=262144)21811339566 &c.(8320,3

+ 6a 48000,0

÷ by 7)56320,3

8045,75 = n and d 45 & $\frac{3dd}{n}$ = 75

— ,75

8045,00 = x. &c.

Thus it appears by the foregoing theorems and examples, let the power be what it may, that the root aſſumed is multiplied by one leſs than the index or exponent of the power, and added to the quotient, which ſum is divided by the index of the power.

Likewiſe, it will be remarked that only a part of the given reſolvends are uſed, and but a ſmall part for obtaining the firſt 3 or 4 figures of the roots required; but a little reflection will convince the mathematician that the firſt figures to the left hand of the reſolvends, contain the efficient powers of their reſpective roots.

SINGLE POSITION.

This rule is alſo called *False Position* or falſe ſuppoſition, becauſe it makes a ſuppoſition of falſe numbers, as if they were the true ones, and by their means, diſcovers the true numbers ſought. The ſingle rule uſes only one ſuppoſition, but the double rule two; whence their names.

To the rule of poſition belong ſuch queſtions as cannot be ſolved by the direct proceſs by any of the former rules; and in which the required number or numbers do not aſcend above the firſt power; ſuch, for example, as moſt of the queſtions uſually brought to exerciſe the reduction of ſimple equations in algebra. But it will not bring out true anſwers, when the numbers ſought aſcend above the firſt power; for then the reſults are not proportional to their poſitions, nor the errors to the difference of the true number of each poſition; yet, in all ſuch caſes, it is a very good approximation, and in exponential equations, as well as many other things, ſucceeds better than perhaps any other method.

Thoſe queſtions, in which the reſults are proportional to their ſuppoſitions, belong to ſingle poſition; ſuch are thoſe which require the multiplication or diviſion of the number ſought by any number, or in which it is to be increaſed or diminiſhed by itſelf any number of times, or by any part or parts of it. But thoſe in which the reſults are not proportioned to their poſitions, belong to the double rule; ſuch are thoſe, in which the number ſought is increaſed or diminiſhed by ſome given number, which is no known part of the number required.

RULE. Take any number, and perform the ſame operations with it as, in the queſtion, are deſcribed to be performed with the number ſought: then, if the reſult be the ſame with that in the queſtion, the ſuppoſed number is the number ſought; but if it be not, ſay, as the reſult of the operation is to the poſition, ſo is the reſult in the queſtion to the number required.

Example.

A perſon after ſpending $\frac{1}{3}$ and $\frac{1}{4}$ of his money, has yet remaining £. 60; what had he at firſt?

Suppoſe he had at firſt £. 120.		**Proof.**	
Now $\frac{1}{3}$ of 120 is	40	$\frac{1}{3}$ of 144 is	48
$\frac{1}{4}$ of it is	30	$\frac{1}{4}$ of it is	39
their ſum is	70	their ſum is	84
which taken from	120	taken from	144
leaves	50	leaves	60
		as per queſtion.	

Then, $50 : 120 :: 60 : \frac{60 \times 120}{50} = \frac{60 \times 12}{5} = 12 \times 12 = 144$.

Sect. XI. Double Position.

Rule. Having taken any two convenient numbers, for the poſitions, proceed with each, according to the conditions of the queſtion, as if it were the true number ſought; and find how much the reſults are different from the reſult in the queſtion. Next multiply each of theſe errors or differences by the other's poſition; then if the errors be of the ſame affection, that is, if the reſults be both either too great or too little, divide the difference of the products by the difference of the errors, and the quotient will be the anſwer; but if the errors be of different affections, that is, if one reſult be too great, and the other too little, divide the ſum of the products by the ſum of the errors, and the quotient will be the anſwer.

Or, having found the errors, ſay, As the ſum or difference of the errors, according as they are of a different, or the ſame kind, is to the difference of the ſuppoſitions, ſo is the leaſt error to the correction of the ſuppoſition belonging to this error; which muſt be added to, or ſubtracted from it, according to the following conditions, viz. If the errors be of the ſame kind, add, or ſubtract the correction, to or from this ſuppoſition, according as it is greater or leſs than the other ſuppoſition; but if the errors be of different kinds, add, or ſubtract, according as the ſuppoſition is the leſs or the greater of the two; and the ſum, or difference will be the number ſought.

Example.

What number is that, which being multiplied by 6, the product increaſed by 18, and the ſum divided by 9, the quotient will be 20?

Firſt, ſuppoſe 30 to be the number ſought.

Then $\frac{30 \times 6 + 18}{9} = 10 \times 2 + 2 = 20 + 2 = 22$; but it ought to be 20; therefore the error is 2 in exceſs.

Again, ſuppoſe 18 to be the number ſought.

Then $\frac{18 \times 6 + 18}{9} = 2 \times 6 + 2 = 12 + 2 = 14$; but it ought to be 20; therefore the error is 6 in defect.

And the errors are of different kinds or affections.

Whence, by the firſt rule, $\frac{30 \times 6 + 18 \times 2}{2 + 6 = 8} = \frac{25 \times 3 + 9}{2} = \frac{54}{2} = 27$, the number ſought.

And, by the ſecond rule, $2 + 6 : 30 - 18 :: 2 : \frac{2 \times 12}{8} = 3$, the correction; then $30 - 3 = 27$, the number ſought.

Conclusion.

We cannot conclude our account of this Science, without acknowledging, that in drawing up the above treatiſe, we have borrowed freely from the celebrated Dr. Hutton's "Complete Treatiſe on Practical Arithmetic;" though we have by no means reſtricted ourſelves entirely to it. We have alſo, in treating of Decimals, omitted the diſtinctions of approximate circular, terminate and interminate; referring the reader for an account of theſe branches of decimal arithmetic to the articles, Decimals and Logarithms. We have alſo adopted Dr. Hutton's, or rather Sir Iſaac Newton's, method of *pointing* our decimals, by placing the ſeparating points againſt the upper part of the figures, to prevent their being miſtaken for ſtops, or pauſes in the reading.

We ſhall only add, in illuſtration of what we advanced, reſpecting the Cypher, that, for want of this uſeful character, the ancients could make no diſtinction between units, tens, hundreds, &c. by their local ſituation. They invented numberleſs characters, (by far too many indeed,) to expreſs different numbers; but for want of this *repreſentative of nothing*, they could make no diſtinction of the *value* of figures by their *places*. It is in *this*, that the perfection of modern arithmetic in a great meaſure conſiſts; the cypher, being the repreſentative of nothing, is ready on all occaſions to ſupply the place of units, tens, hundreds, &c. to the utmoſt extent of numeration, (if the paradox may be pardoned, to ſpeak of an *utmost extent* in a caſe of *infinity*,) as often as the figures, previouſly occupying theſe places, require, by addition, multiplication, &c. to be tranſmitted to a higher claſs. This uſe of the cypher it muſt be obvious could not take place, with equal regularity and uniformity, (if, indeed, it could at all,) upon any other plan but that of the decadary ſyſtem. When the ſexageſimal arithmetic was invented by Ptolemy, the cypher and the nine digits were not known: and his marks above enumerated clearly ſhow how imperfect every other ſyſtem but the decadary, muſt prove in practice.

Arithmetic, instrumental, a ſpecies of arithmetic, wherein the common rules are performed by means of inſtruments contrived for expedition: ſuch as, ſeveral ſorts of ſcales, and ſliding rules, &c. particularly thoſe denominated Napier's Bones, which ſee. The Chineſe uſe inſtruments in their calculations, and pay little regard to arithmetical rules. See Abacus, and Schwan-pan.

Arithmetic, literal or specious, arithmetic performed by letters inſtead of figures. See Algebra.

Arithmetic, Logarithmical. See Logarithms.

Arithmetic of infinites, a method invented by Dr. Wallis, of ſumming up a ſeries of numbers, conſiſting of infinite terms, or of finding the ratios thereof. It is uſeful in geometry, but every thing performed by it, is more eaſily operated by Fluxions.

ARITHMETICAL, *adj.* according to the rules or method of arithmetic.

Arithmetical complement of a logarithm. See Logarithms.

ARITHMETICALLY, *adv.* in an arithmetical manner; according to the principles of arithmetic.

ARITHMETICIAN, *n. s.* a maſter of the art of numbers.

ARK, *n. s.* 1. A veſſel to ſwim upon the water, uſually applied to that in which Noah was preſerved from the univerſal deluge. 2. The repoſitory of the covenant of God with the Jews.

ARK, NOAH'S CONJECTURES RESPECTING. The ark has afforded ſeveral points of curious inquiry among the critics and naturaliſts, relative to its form, capacity, materials, &c. The wood whereof the ark was built is called in the Hebrew *gopher wood*, and in the Septuagint *ſquare timbers*. Some tranſlate the original *cedar*, others *pine*, others *box*, &c. There are various opinions with reſpect to the meaning of the original word, ſome contending, that it ought to be tranſlated *cedar*, others *pine*, others *box*; although the greateſt number of the learned ſeem to be of opinion, that it was cedar, on account of the great quantities of that wood which is to be found in the country where the ark was built. In what place Noah built and finiſhed his ark is no leſs a matter of diſputation. But the generally received opinion is, that it was built in Chaldea, in the territories of Babylon.

The dimenſions of the ark, as given by Moſes, are 300 cubits in length, 50 in breadth, and 30 in height; which ſome have thought too ſcanty, conſidering the number of things it was to contain; and hence an argument has been drawn againſt the authority of the relation. To ſolve this difficulty many of the ancient fathers, and the modern critics, have been put to very miſerable ſhifts: But Buteo and Kircher have proved geometrically, that, taking the common cubit of a foot and a half, the ark was abundantly ſufficient for all the animals ſuppoſed to be lodged in it. Snellius computes the ark to have been above half an acre in area. Dr. Arbuthnot computes it to have been 81062 tons. It contained, beſides eight perſons of Noah's family, one pair of every ſpecies of unclean animals, and 7 pair of every ſpecies of clean animals, with proviſions for them all during the whole year. The former appears, at firſt view, almoſt infinite; but if we come to a calculation, the number of ſpecies of animals will be found much leſs than is generally imagined; out of which, in this caſe, are excepted ſuch animals as can live in the water; and biſhop Wilkins ſhows that only 72 of the quadruped kind needed a place in the ark. By the deſcription Moſes gives of the ark, it appears to have been divided into three ſtories, ten cubits each, or 15 feet high; and it is agreed on, as moſt probable, that the loweſt ſtory was for the beaſts, the middle for the food, and the upper for the birds, with Noah and his family; each ſtory being ſubdivided into different apartments, ſtalls, &c. though Joſephus, Philo, and other commentators, add a kind of fourth ſtory, under all the reſt; being, as it were, the hold of the veſſel, to contain the ballaſt and receive the filth and feces of ſo many animals. As to the number of animals contained in the ark, Buteo computes that it could not be equal to 500 horſes; he even reduces the whole to the dimenſions of 56 pair of oxen. F. Lamy enlarges it to 64 pair of oxen, or 128 oxen; ſo that, ſuppoſing one ox equal to two horſes, if the ark had room for 256 horſes, there muſt have been room for all the animals. But the ſame author demonſtrates, that one floor of it would ſuffice for 500 horſes, allowing nine ſquare feet to a horſe. As to the food in the ſecond ſtory, it is obſerved by Buteo from Columella, that 30 or 40 pounds of hay ordinarily ſuffices for an ox a day; and that a ſolid cubit of hay, as uſually preſſed down in our hay ricks, weighs about 40 pounds; ſo that a ſquare cubit of hay is more than enough for one ox in one day. Now, it appears, that the ſecond ſtory contained 150,000 ſolid cubits; which divided between 206 oxen will afford each more hay, by two thirds, than he can eat in a year. Biſhop Wilkins computes all the carnivorous animals equivalent, as to the bulk of their bodies, and their food, to 27 wolves; and all the reſt to 280 beeves. For the former, he allows 1825 ſheep; and for the latter, 109,500 cubits of hay; all which will be eaſily contained in the two firſt ſtories, and a deal of room to ſpare. As to the third ſtory, no body doubts of its being ſufficient for the fowls; with Noah, his ſons, and daughters. Upon the whole, the learned biſhop remarks, that of the two, it appears more difficult to aſſign a number and bulk of neceſſary things to anſwer the capacity of the ark, than to find ſufficient room for the ſeveral ſpecies of animals already known to have been there. This he attributes to the imperfection of our liſt of animals, eſpecially of thoſe of the unknown parts of the earth; adding, that the moſt expert mathematician at this day could not aſſign the proportion of a veſſel better accommodated to the purpoſe than is here done: and hence he concludes, that the capacity of the ark, which had been made an objection againſt ſcripture, ought to be eſteemed a confirmation of its divine authority; ſince, in thoſe ruder ages, men, being leſs verſed in the arts and philoſophy, were more obnoxious to vulgar prejudices than now; ſo that, had it been an human invention, it would have been contrived, according to thoſe notions which from a confuſed and general view of things as much *too big* as it had been repreſented too little. Beſides the places requiſite for the beaſts and birds, and their proviſions, there was room, therefore, ſufficient for Noah's houſehold utenſils, inſtruments of huſbandry, and ſeeds to ſow after the deluge; for which purpoſes, he might ſpare room in the third ſtory for 36 cabins; beſides a kitchen, a hall, four chambers, and a ſpace about 48 cubits in length to walk in.

ARK OF THE COVENANT, a ſmall cheſt or coffer, three feet nine inches in length, two feet three inches in breadth, and two feet three inches in height, in which were contained the golden pot with manna, Aaron's rod, and the tables of the covenant. The ark was depoſited in the holieſt place of the tabernacle. It was taken by the Philiſtines, and detained 20, ſome ſay 40 years, at Kirjath-jearim; but the people being afflicted with emerods on account of it, returned it with divers preſents. It was afterwards placed in the temple. The lid of the ark was called the *propitiatory* or *mercy ſeat*; over which were two figures of cherubims placed, with expanded wings of a peculiar form. The high prieſt appeared before this mercy ſeat once every year on the great day of expiation; and the Jews, wherever they worſhipped, turned their faces towards the place where the ark ſtood. In the ſecond temple there was alſo an ark, made of the ſame ſhape and dimenſions with the firſt, and put in the ſame place, but without any of its contents and peculiar honours. It was uſed as a repreſentative of the former on the day of expiation, and a repoſitory of the original copy of the holy Scriptures, collected by Ezra and the men of the great ſynagogue, after the captivity.

In imitation of the ark of the covenant, the Jews to this day have a kind of ark in their ſynagogues, wherein their ſacred books are depoſited. This they call *aron.* Leo of Modena gives a deſcription of it, in his Account of the Cuſtoms and Ceremonies of thoſe of his Nation. "The Jews (ſays he) in the eaſtern ſides of their ſynagogues, have an ark, or armory, called ARON, to the memory of the ark of the covenant. In this are preſerved the five books of Moſes, written on vellum, with ink made on purpoſe," &c. Some have ſuppoſed that the figure of this ark is ſtill remaining on the triumphal arch of Titus at Rome; though Villapandus and others, with great reaſon, are of opinion, that it is the table of ſhew-bread. *Prideaux's Con.* vol. I. p. 209. A cheſt, very nearly reſembling the Jewiſh ark, and called the *houſe of the God*, was found in the Huaheine, one of the iſlands in the ſouth ſea. Mr. Banks could obtain no other information concerning it than what the name imports. *Hawkesworth's Account*, vol. II. p. 252.

ARLES, a large and ancient city of France, in the department of the Mouths of the Rhone. It is celebrated for its antiquities, many of which are ſtill to be ſeen; ſuch as the amphitheatre, the obeliſk, the Elyſian Fields, the ſepulchres, columns with their capitals, buſts, pedeſtals, aqueducts, with ſome remains of the capitol, and the Roman gods. Arles has an academy of ſciences, conſiſting of 30 members, who muſt be natives and inhabitants. The city is ſurrounded with marſhy land, which renders the air full of vapours, and makes it unwholeſome. The air of the country around, however, is ſalubrious, and the grounds produce excellent wines, fruits, olives, manna, vermillion, &c. Arles is ſituated 12 miles S. E. of Niſmes, 35 N. W. of Marſeilles, and 430 S. by E. of Paris. Long 79. 48. E. Lat. 43. 40. N.

ARM, *n. s.* 1. The limb which reaches from the hand to the ſhoulder. See ANATOMY.—2. The bough of a tree.—3. An inlet of water from the ſea.—4. Power; might. In this ſenſe is uſed the ſecular arm, &c.

ARM, in horſemanſhip, is applied to a horſe, when, by preſſing down his head, he endeavours to defend himſelf againſt the bit, to prevent his being checked by it. The remedy is, to have a wooden ball covered with velvet, or other matter, put on his chaul, which will ſo preſs him between the jaw-bones as to prevent his bringing his head ſo near his breaſt.

ARM, in magnetiſm. A loadſtone is ſaid to be armed, when it is capped, caſed, or ſet in iron or ſteel, in order to make it take up the greater weight, and alſo to diſtinguiſh readily its poles. See MAGNETISM.

ARM OF AN ANCHOR, the part to which the fluke is ſet.

To ARM, *v. a.* 1. To furniſh with armour of defence, or weapons of offence.—2. To plate with any thing that may add ſtrength.—3. To furniſh; to fit up.—4. To provide againſt.

To ARM, *v. n.* to take arms; to be fitted with arms.

To ARM A SHOT, in gunnery, to roll oakham, rope-yarn, or old rags about the end of the iron bar which paſſes through the ſhot.

ARMADA, *n. s.* a Spaniſh term, ſignifying a fleet of war. The armada, which attempted to invade England in the time of queen Elizabeth, is famous in hiſtory. It was partly ſcattered by the wind and partly ſubdued by the Engliſh fleet. On which occaſion a medal was ſtruck with this motto—*Afflavit Deus et dissipantur.* God breathed upon them and they are ſcattered.

ARMADILLO, *n. s.* a four-footed animal of Brazil, as big as a cat, with a ſnout like a hog, a tail like a lizard, and feet like a hedge-hog. He is armed all over with hard ſcales like armour, whence he takes his name, and retires under them like the tortoiſe. He lives in holes, or in the water, being of the amphibious kind. His ſcales are of a bony or cartilaginous ſubſtance; but they are eaſily pierced. This animal hides himſelf a third part of the year under ground. He feeds upon roots, ſugar-canes, fruits, and poultry. When he is caught, he draws up his feet and head to his belly, and rolls himſelf up in a ball, which the ſtrongeſt hand cannot open; and he muſt be brought near the fire before he will ſhew his noſe. His fleſh is white, fat, tender, and more delicate than that of a ſucking pig.

ARMADILLO, in zoology, a ſynonime of the daſypus. See DASYPUS.

ARMAGH, a town of Ireland, and capital of the county of the ſame name, is ſeated near the river Kalin, 57 miles S. of Londonderry, and 63 N. of Dublin. It is the ſee of the primate of all Ireland, and is ſaid to have been founded by St. Patrick in the fifth century. Lat. 54. 37. N. Long. 68. 39. E.

ARMAMENT, *n. s.* a force equipped for war; generally uſed of a naval force. The word armament is alſo uſed for a ſtorehouſe for arms.

ARMATURE, *n. s.* armour.

ARMED, in the ſea language. A croſs bar ſhot is ſaid to be armed, when ſome rope yarn or the like is rolled about the end of the iron bar, which runs through the ſhot.

ARMED SHIP, a veſſel occaſionally taken into the ſervice of the government in time of war, and employed to guard ſome particular coaſt, or attend on a fleet. She is therefore armed and equipped in all reſpects like a ſhip of war, and commanded by an officer of the navy, who has the rank of a maſter and commander. All Britiſh ſhips of this ſort are upon the eſtabliſhment of the king's ſloops, having a lieutenant, maſter, purſer, ſurgeon, &c.

ARMENIA, a country of Aſia, anciently divided into Armenia Major and Minor. It had formerly kings of its own, but was made a Roman province by Veſpaſian, and continued ſo till the diviſion of the empire, when it was ſubjected to the emperors of the eaſt; and, on the decline of their power, was ſubdued firſt by the Perſians, and afterwards by the Turks, who gave it the name of *Genech*, and have kept it ever ſince.

This country is ſtill divided into Major and Minor, or the Greater and Leſſer Armenia. Greater Armenia comprehends what is now called *Turcomania.* It has Georgia on the N. from which it is ſeparated by high mountains; the Euphrates on the W. Diarbeker, Curdiſtan, and Aderbijan, on the S. and Skirvan on the E. That part of Armenia ſubject to Perſia is chiefly contained in the province of Aran, in which are ſeveral fine towns; as, Erivan or Rivan, the capital of the whole; Ganjals, one of the fineſt cities in Perſia, in the N. of the province, near the Kur; Kapan, on the S. ſide; near the Aras; beſides ſeveral others. The country in general is full of mountains and valleys, lakes, and rivers; particularly the country about the three churches, near Erivan, is admirably fine, being full of rivulets, which render it extremely fruitful. Beſides great quantities of all ſorts of grain, there are fields of a prodigious extent covered with tobacco: but it is not a native of Armenia, for it all came originally from America. The reſt of the country produces rice, cotton, flax, melons, and grapes: in ſhort, there is nothing wanting but olives; which is by ſome thought to prove that the ark could not reſt on mount Ararat, becauſe the dove brought an olive branch in her mouth, and this tree never leaves a place where it once grew. It ſeems, however, to have been otherwiſe anciently: for Strabo tells us, that the olive grew in Gogarene, a province of Armenia. The water-melons are as cool as ice in the hotteſt day, and melt in the mouth; the beſt are produced in the ſalt lands, near the three churches and the river Aras. After rain, the ſea ſalt lies in cryſtals upon the fields, and even crackles under the feet. About ten miles from the three churches, in the road to Teflis, there are pits or quarries of foſſile ſalt, which yield enough to ſupply all Perſia, without being exhauſted; they cut it into large pieces like ſtone, and each buffalo carries two of them; the mountain from whence it is dug is nothing but a maſs of ſalt, which appears like a rock of ſilver, when the ſun ſhines on the places not covered with earth. This country has been remarkable for its extreme cold from the remoteſt antiquity.

The Armenians are an honeſt, civil, polite people, ſcarce troubling themſelves about any thing elſe but trade, which they carry on in moſt parts of the world, by which means they have ſpread themſelves over the eaſt, and alſo great part of Europe; and wherever they come, commerce is carried on with ſpirit and advantage.

The religion of the Armenians is the Chriſtian, ſaid to have been firſt planted among them by St. Bartholomew. They are in general of the Eutychian ſect; that is, they own but one nature in Jeſus Chriſt; and when they ſpeak of the hypoſtatical union, ſay that he is perfect God and perfect man without mixture. The Armenian clergy conſiſt of patriarchs, archbiſhops, doctors, ſecular prieſts, and monks. The ſecular prieſts are not allowed to marry a ſecond time: and therefore they take care to chooſe young healthy wives: they maintain themſelves and families by ſome occupation, inſomuch, that they have hardly time to perform their eccleſiaſtical functions; they lie in the churches on the vigils of thoſe days they are obliged to officiate. The Armenian monks are of the order of St. Baſil; and every Wedneſday and Friday they eat neither fiſh, eggs, oil, nor any thing made of milk, and during Lent they live upon nothing but roots; they are allowed wine only on the Saturday in the Holy Week, and meat on the Eaſter Sunday. Beſides the great Lent, they have four others of eight days each, which are inſtituted to prepare for the four great feſtivals of the Nativity the Aſcenſion, the Annunciation, and of St. George; in which times they muſt not ſo much as ſpeak of eggs, fiſh, oil, or butter! The Armenians abſtain at all times from eating of blood and things ſtrangled. They have ſeven ſacraments; baptiſm, confirmation, penance, the euchariſt, extreme unction, orders and matrimony. The women do not go to church till 40 days after their delivery: and they obſerve many Jewiſh cuſtoms. At the communion, to which infants of two or three months old are admitted, the prieſts give a piece of the conſecrated hoſt ſoaked in the conſecrated wine. The elements are covered with a great veil, and placed in a cup-board near the altar, on the ſide of the goſpels. When the prieſt takes the chalice and pattin, he is followed by his deacons and ſubdeacons, with flambeaux and plates of copper furniſhed with bells: in this manner, with a cenſer before him, he goes in proceſſion round the ſanctuary; he then ſets them on the altar, pronounces the words of conſecration, and turns himſelf to the people, who fall down, kiſs the earth, and beat their breaſts; then, after taking it himſelf, he diſtributes the hoſt ſoaked in wine to the people. They conſecrate holy water but once a year; at which time every one fills a pot and carries it home, which brings in a conſiderable revenue to the church. The Armenians ſeem to place the chief part of their religion in faſtings and abſtinences; and among the clergy, the higher the degree the lower they muſt live; inſomuch that it is ſaid the archbiſhops live on nothing but pulſe.

ARMENIAN Bole. See Bole.

ARMENUS lapis, *Armenian stone*, in natural hiſtory, a mineral ſubſtance, improperly called a *stone*; being no other than an ocherous earth, and properly called *blue ochre*. It is a very valuable ſubſtance in painting, being a bright and lively blue. It was ſo highly eſteemed among the ancients, that counterfeits were commonly attempted. Theophraſtus has recorded it as a thing judged worthy a place in the Egyptian annals, which of their kings had the honour of inventing the factitious kind; and he tells us the genuine native ſubſtance was a thing of that value, that preſents were made of it to great perſons, and that the Phœnicians were accuſtomed to pay their tribute in it.—It is a very beautiful earth, of an even and regular texture; and of a fine blue, ſometimes deeper, ſometimes paler, and frequently mixed with green. It is ſoft, tender, and light; of an even, but ſomewhat duſty ſurface; it adheres firmly to the tongue, and is dry, but not harſh to the touch. It eaſily breaks between the fingers, and does not ſtain the hands. It is of a brackiſh diſagreeable taſte, and does not ferment with acids. It is a very ſcarce foſſil; but is found very pure, though in ſmall quantities, in the mines at Goſſelaer in Saxony. It is frequently found ſpotted with green, and ſometimes with black; and very often is mixed among the green ochre, called *berggruen* by the Germans, which has thence been erroneouſly called by its name. See Bice.

ARM-HOLE, *n. s.* the cavity under the ſhoulder.

ARMIGEROUS, *adj.* bearing arms.

ARMILLARY, *adj.* reſembling a bracelet.—When the circles of the mundane ſphere are ſuppoſed to be deſcribed on the convex ſurface of a ſphere, which is hollow within, and, after this, you imagine all parts of the ſphere's ſurface to be cut away, except thoſe parts on which ſuch circles are deſcribed; then that ſphere is called an *armillary* ſphere, becauſe it appears in the form of ſeveral circular rings, or bracelets, put together in a due poſition.

Armillary ſphere, an artificial ſphere, which revolves upon its axis within a ſilvered horizon, which is divided into degrees, and moveable every way upon a braſs ſupporter. The other parts are the equinoctial, zodiac, meridian, the two tropics, and the two polar circles. It is repreſented in Plate X. fig. 7, where P and Q repreſent the poles of the world, AD the equator, E L the ecliptic and zodiac, P A G D the meridian, or the ſolſtitial colure, T the earth, F G the tropic of cancer, A T the tropic of capricorn, M N the arctic circle, O V the antarctic, N and O the poles of the ecliptic, and R S the horizon. The *armillary* ſphere conſtructed by Dr. Long, in Pembroke-hall, Cambridge, is 18 feet in diameter; and more than 30 perſons may conveniently ſit in it. The lower part of the ſphere inviſible in England is cut off; the whole apparatus is ſo contrived that it may be turned round with as little labour as it takes to wind up a jack. See Geography.

Armillary trigonometer, an inſtrument firſt contrived by Mr. Mungo Murray, and improved by Mr. Ferguſon, conſiſting of five ſemicircles, viz. meridian, vertical circle, horizon, hour circle, and equator; ſo adapted to each other by joints and hinges, and ſo graduated and divided, as to ſerve for expeditiouſly reſolving many problems in aſtronomy, dialling, and ſpherical trigonometry. For the drawing, deſcription, and method of uſing it, ſee Ferguſon's Tracts, p. 80, &c.

ARMINGS, *n. s.* the ſame with waſtecloaths, being clothes hung about the outſide of the ſhip's upper works fore and aft, and before the cubbridge heads. Some are alſo hung round the tops, called *top-armings*.

ARMINIANISM, the doctrine of Arminius and of his followers. See Arminians.

ARMINIANS, a religious ſect, which aroſe in Holland, by a ſeparation from the Calviniſts. They followed the doctrine of Arminius, who was an eminent profeſſor of divinity at Leyden, and flouriſhed about the year 1600. The diſtinguiſhing tenets of the Arminians may be compriſed in the following five articles; relating to predeſtination, univerſal redemption, the corruption of man, converſion, and perſeverance, viz. 1ſt. That God has not fixed the future ſtate of mankind by an abſolute unconditional decree; but determined from all eternity, to beſtow ſalvation on thoſe whom he foreſaw would perſevere to the end in their faith in Jeſus Chriſt, and to inflict puniſhments on thoſe who ſhould continue in their unbelief, and reſiſt to the end his divine aſſiſtance. 2dly. That Jeſus Chriſt, by his death and ſufferings, made an atonement for the ſins of all mankind in general, and of every individual in particular; that however none but thoſe who believe in him can be partakers of this divine benefit. 3dly. That mankind are not totally depraved, and that depravity does not come upon them by virtue of Adam's being their public head, but that mortality and natural evil only are the direct conſequences of his ſin to poſterity. 4thly. That there is no ſuch thing as irreſiſtible grace, in the converſion of ſinners. And, 5thly. That thoſe who are united to Chriſt by faith, may fall from their faith and forfeit finally their ſtate of grace. Thus the followers of Arminius believe that God, having an *equal* regard for all his creatures, ſent his Son to die for the ſins of the *whole world;* that men have the power of doing the will of God, otherwiſe they are not the proper ſubjects of approbation and condemnation; and that, in this preſent imperfect ſtate, believers, if not peculiarly vigilant, may through the force of temptation, fall from grace, and ſink into final perdition.

Whitby, the celebrated commentator, has written a large and elaborate defence of Arminianiſm; and the reader ſhould conſult Dr. Taylor's *Key to the Epistle to the Romans*, which has been much admired, on the ſubject. Since the days of Laud, (who was Archbiſhop of Canterbury in the reign of Charles the Firſt) by far the majority of the Engliſh clergy have taken this ſide of the queſtion. Biſhop Burnet has given a full account of the opinions of this ſect, in his *Exposition* of the Seventeenth Article.

In the laſt century diſputes ran very high in Holland between the Calviniſts and the Arminians. On each ſide conſiderable talents and learning were diſplayed; but ſome injudiciouſly called in the interference of the civil power, and thus terminated a controverſy, which for ſome years had agitated the religious world. For this purpoſe the famous ſynod of Dort was held, 1618, and a curious account of its proceedings may be ſeen in a ſeries of letters written by the ever-memorable John Hales, who was preſent on the occaſion. This ſynod was ſucceeded by a very ſevere and ſhameful perſecution of the Armenians. The reſpectable Barnevelt loſt his head on a ſcaffold, and the learned Grotius, being condemned to perpetual impriſonment, fled and took refuge in France. The ſtorm however ſome time after abated, and Epiſcopius, an Arminian miniſter, opened a ſeminary in Amſterdam, which produced ſome able divines and excellent ſcholars.

The Arminians are ſometimes called the Remonſtrants, becauſe they, in 1611, preſented a remonſtrance to the States General, wherein they pathetically ſtate their grievances, and pray for relief. See an intereſting work, entitled an Abridgement of Gerrard Brandt's Hiſtory of the Reformation in the Low Countries, 2 vols. 8vo.

ARMIPOTENCE, *n. s.* power in war.

ARMIPOTENT, *adj.* powerful in arms; mighty in war.

ARMISTICE, *n. s.* a ſhort truce; a ceſſation of arms for a ſhort time.

ARMLET, *n. s.* 1. A little arm; as, an *armlet* of the ſea.—2. A piece of armour for the arm.—3. A bracelet for the arm.

ARMORER, *n. s.* 1. He that makes armour, or weapons. The armorer of a ſhip is a perſon whoſe office is to take care that the arms be in a condition fit for ſervice.—2. He who dreſſes another in armour.

ARMORIAL, *adj.* belonging to the arms or eſcutcheon of a family.

ARMORIST, *n. s.* a perſon ſkilled in heraldry.

ARMORY, *n. s.* 1. The place in which arms are repoſited for uſe.—2. Armour; arms of defence.—3. Enſigns armorial.

ARMOUR, *n. s.* defenſive arms.

Armour bearer, *n. s.* he who carries the armour of another.

ARMOURER. See Armorer.

ARMPIT, *n. s.* the hollow place under the ſhoulder. See Axilla.

ARMS. *n. s. without the ſingular number.* 1. Weapons of offence, or armour of defence.—2. A ſtate of hoſ tility.—3. War in general.—4. Action; the act of taking arms.—5. The enſigns armorial of a family.—6. Arms alſo are uſed figuratively for the profeſſion of a ſoldier. Thus we ſay, he was bred to arms.

Arms, stand of, ſignifies a muſket, a bayonet, a ſword, belt, and cartridge-box.

Arm's end, *n. s.* a phraſe taken from boxing, in which the weaker man may overcome the ſtronger, if he can keep him from cloſing.

ARMY, *n. s.* a collection of armed men, obliged to obey one man.

Army is rather more accurately defined, a large number of ſoldiers, conſiſting of horſe and foot, completely armed, and provided with artillery, ammunition, proviſions, &c. under the command of one general, having lieutenant generals, major generals, brigadiers, and other officers under him. An army is compoſed of ſquadrons and battalions; and is uſually divided into three corps, and formed into three lines: the firſt is called the *van-guard*, the ſecond the *main-body*, and the third the *rear-guard*, or *body of reserve.* The middle of each line is poſſeſſed by the foot; the cavalry form the right and left wing of each line; and ſometimes they place ſquadrons of horſe in the intervals between the battalions. See Military Affairs.

Army, naval, or sea army, is a number of ſhips of war, equipped and manned with ſailors and marines, under the command of an admiral, with other inferior officers under him. See Naval Tactics.

Army of observation, is employed by beſiegers, to prevent relief being brought into a place, or the ſiege being raiſed by the enemy.

Army, standing, an army kept conſtantly in pay, and ready for action, in peace as well as in war. Men of republican principles are jealous of a ſtanding army as dangerous to liberty; and the hiſtory of nations has ſufficiently ſhown, that their fears on this head are by no means groundleſs. The ſtanding army of Cæſar deſtroyed the Roman Republic: the ſtanding army of Cromwell turned the long parliament out of doors, and, even, in our own time, Bonaparte, by means of his ſtanding army, annihilated the conſtitution of his country, and elevated himſelf to ſupreme power. Since then ſtanding armies have been found in all ages to be ſo injurious to the cauſe of liberty, how ſhall a nation defend itſelf from domeſtic tumults and foreign invaſion? We anſwer, by a well regulated and well diſciplined militia. We muſt confeſs, however, when we take a view of the United States, that our liberties may be much endangered by the deplorable ſtate of our militia laws, and ſincerely regret, that though the hiſtory of the world is ſo full of the uſurpations of ſtanding armies, moſt, if not all of our ſtates, have ſo far neglected this ſafer mode of defence, as to afford a pretext, at leaſt for employing thoſe dangerous protectors. A little reflection might convince us, that an armed and diſciplined nation would be ſo invulnerable, as to defy external violence, and a confidence reſulting from a contemplation of the national force, would preclude the poſſibility of government draining the public purſe, by expenſive armaments, or alarming the credulous, by the terrors of invaſion. By our numbers and diſcipline, we ſhould always be ready for war, and by our armies, conſiſting ſolely of the people, on whom the expence would fall, we ſhould always be diſpoſed for peace.

ARNHEIM, or Arnheim, a conſiderable town of the Batavian republic, and the chief place of the department of the Rhine, formerly Guilderland. It is ſituated 8 miles N. of Nimeguen, and 32 E. by S. of Utrecht. It is adorned with ſeveral fine churches, particularly that of St. Walburg and of St. Euſebius; which laſt has a very high tower. The town has five gates, and ſeveral fine ramparts. There is a canal between this place and Nimeguen, by means of which, a conſiderable trade is carried on. The air is very healthful. Long. 80. 55. E. Lat. 52. 0. N.

ARNOTTA, or Arnot, in botany, a name given by the peaſants of Burgundy, and many other places, to certain roots which they frequently turn up, from five or ſix inches in depth, in plowing the ground. They carefully collect theſe, and eat them, after roaſting in the aſhes, or otherwiſe; by which ſort of cooking they acquire the taſte of a cheſnut, and are found to be a very wholeſome and nouriſhing food. They are blackiſh on the outſide, and white within, and are of the ſize of a ſmall walnut. They are common in the north of Scotland, where they are called arnots.

AROMA, flavour; fragrance.

Aroma is, by ſome authors, peculiarly applied to myrrh.

Aroma germanicum, a denomination given by Platerus to elecampane; by others to juniper berries, on account of the great eſteem they are held in by the *Germans*, for their ſpicy, warm qualities; being by many preferred to ginger.

AROMATIC, or aromatical, *adj.* ſpicy; fragrant; high ſcented.

Aromatics, *n. s.* ſpices, drugs, plants or the like, which yield a briſk, fragrant ſmell, and a warm ſpicy taſte. See Materia Medica.

AROMATIZATION, *n. s.* the mingling of a due proportion of aromatick ſpices or drugs with any medicine.

To AROMATIZE, *v. a.* 1. To ſcent with ſpices; to impregnate with ſpices.—2. To ſcent; to perfume.

AROSE, the preterite of the verb *ariſe.* See Arise.

AROUND, *adv.* 1. In a circle.—2. On every ſide.

Around, *prep.* about; encircling.

To AROUSE, *v. a.* 1. To wake from ſleep.—2. To raiſe up; to excite.

AROW, *adv.* in a row.

ARR, *n. s.* a ſcar.

ARRACK, ſee Arack.

ARRAGON, a province of Spain, bounded on the N. by the Pyrenean mountains, which ſeparate it from France; on the W. by Navarre and the two Caſtiles; on the S. by Valencia; and on the E. by Catalonia. It is 180 miles long, and 140 broad; but the land is mountainous, dry, and ſtony, badly cultivated, and worſe peopled. Its principal rivers are the Ebro, which croſſes it in the middle, the Xalo, the Cinea, the Galego, and the Arragon. The air is pure and wholeſome: and there are mines of iron, and ſome ſay of gold. The moſt fertile parts are about the rivers; where the land produces corn, wine, oil, flax, hemp, various fruits, and a ſmall quantity of ſaffron; beſides feeding large flocks of ſheep, and plenty of game in the woods. Saragoſſa is the capital of this province.

To ARRAIGN, *v. a.* 1. To ſet a thing in order, or in its place.—2. To accuſe; to charge with faults in general, as in controverſy, in a ſatire.

ARRAIGNMENT, *n. s.* the act of arraigning; an accuſation; a charge.

Arraignment, in law, the arraigning or ſetting a thing in order, as a perſon is ſaid to arraign a writ of novel diſſeſin, who prepares and fits it for trial. The word is moſt properly uſed to call a perſon to anſwer in form of law upon an indictment, &c. When brought to the bar, the criminal is called upon by name to hold up his hand; which, though it may ſeem a trifling circumſtance, yet is of this importance, that by the holding up of his hand *conſtat de perſona*, and he owns himſelf to be of that name by which he is called. However it is not an indiſpenſable ceremony; for, being calculated merely for the purpoſe of identifying the perſon, any other acknowledgement will anſwer the purpoſe as well; therefore, if the priſoner obſtinately and contemptuouſly refuſes to hold up his hand, but confeſſes he is the perſon named, it is fully ſufficient. Then the indictment is to be read to him diſtinctly, that he may fully underſtand his charge. After which it is to be demanded of him, whether he be guilty of the crime whereof he ſtands indicted, or not guilty? When a criminal is arraigned, he either ſtands mute or confeſſes the fact, or elſe he pleads to the indictment. If he ſays nothing, according to the laws of the United States, it is deemed equivalent to a conviction, and he ſhall receive the ſame judgment and execution. The Engliſh judgment of penance for ſtanding mute was as follows: That the priſoner be remanded to the priſon from whence he came, and put into a low, dark chamber: and there be laid on his back, on the bare floor, naked, unleſs where decency forbids; that there be placed upon his body as great a weight of iron as he could bear, and more; that he have no ſuſtenance, ſave only, on the firſt day, three morſels of the worſt bread; and, on the ſecond day, three draughts of ſtanding water that ſhould be neareſt to the priſon door; and in this ſituation this ſhould be alternately his daily diet, *till he died*, or, as anciently the judgment ran, *till he anſwered.* This cruel proceſs is now, however, aboliſhed in Great-Britain, and the ſtanding mute is conſidered as confeſſion of the charge. If the priſoner made a ſimple and plain confeſſion, the court hath nothing to do but to award judgment: but it is uſually very backward in receiving and recording ſuch confeſſion, out of tenderneſs to the life of the accuſed; and will generally adviſe the priſoner to retract it, and plead to the indictment; as to which, ſee the article Indictment.

ARRAN, an iſland of Scotland, in the frith of Clyde, [illegible] miles long and 11 broad. Ridges of rugged mountains extend acroſs the iſland, but their ſides are fertile. The climate is ſevere but healthful, and invalids annually reſort thither to drink goat whey. On the coaſt are many wonderful caverns, which often afford ſhelter to ſmugglers. They were once the retreat of ancient heroes. Tradition preſerves the memory of Fingal and Robert Bruce, who took refuge in this iſland, during the time of his greateſt diſtreſs.

To ARRANGE, *v. a.* to put in the proper order for any purpoſe.

ARRANGEMENT, *n. s.* the act of putting in proper order; the ſtate of being put in order.

Arrangement, in philoſophy. The experiments of modern philoſophers have put it paſt a doubt that the diverſity of the colours of bodies depends entirely on the ſituation and arrangement of the parts, which reflect the ſight differently; the diverſity of taſtes and ſmells on the different arrangements of the pores, which render them differently ſenſible; and the general diverſity of bodies on the different arrangement of their parts.

Arrangement, in rhetoric, has great effect. The happy arrangement of words makes one of the greateſt beauties of diſcourſe. See Oratory.

ARRANT, *adj.* bad in a high degree; as an *arrant* rogue.

ARRANTLY, *adv.* corruptly, ſhamefully.

ARRAS, a city of France, in the department of the Straits of Calais; formerly the capital of the ci-devant province of Artois. It is ſeated on a mountain; and the parts about it are full of quarries, where good ſtones are got for building. It has four gates, and a ſtrong citadel with 5 baſtions; and was the ſeat of a biſhop, previous to the late revolution. There are 10 pariſh churches. Arras is ſituated 12 miles S. W. of Doway. Long. 77. 50. E. Lat. 50. 20. N.

Arras, *n. s.* tapeſtry; hangings woven with images.

ARRAY, *n. s.* 1. Order, chiefly of war.—2. Dreſs.—3. In law, the ranking or ſetting forth of a jury or inqueſt of men impannelled upon a cauſe.

To Array, *v. a.* 1. To put in order.—2. To deck; to dreſs; to adorn the perſon.—3. In law. See Array in law.

ARREAR, *adv.* behind. See Rear.

Arrear, *n. s.* that which remains behind unpaid though due.

ARREARAGE, *n. s.* the remainder of an account.

ARREPTITIOUS, *adj.* 1. Snatched away.—2. Crept in privily.

ARREST, *n. s.* 1. In law. A ſtop or ſtay; as, a man apprehended for debt, is ſaid to be arreſted.—2. Any caption, or ſeizure of the perſon.

Arreſt, in Engliſh law, is either uſed in civil or in criminal caſes.

1. *An* Arreſt, in a civil cauſe, is defined to be the apprehending or reſtraining one's perſon by proceſs in execution of the command of ſome court. An arreſt muſt be by corporal ſeiſing or touching the defender's body; after which the bailiff may juſtify breaking open the houſe in which he is, to take him: otherwiſe he has no ſuch power; but muſt watch his opportunity to arreſt him. For every man's houſe is looked upon by the law to be his caſtle of defence and aſylum, wherein he ſhould ſuffer no violence. Peers of Great-Britain, and members of parliament are privileged from arreſts. Senators and repreſentatives of congreſs of the United States, alſo members of the ſtate legiſlature, are in all caſes except treaſon, felony, and breach of the peace, privileged from arreſt, during their attendance at the ſeſſion of their reſpective houſes, and in going to or returning from the ſame. Privates in the army and navy of the United States, are likewiſe exempted from arreſt for debts.

Suitors, witneſſes, and other perſons, neceſſarily attending any courts of record upon buſineſs, are not to be arreſted during their actual attendance, which includes the neceſſary coming and returning. And laſtly, no arreſt can be made, nor proceſs ſerved, upon a Sunday, except for treaſon, felony, or breach of the peace.

2. *An* **Arrest, in a criminal cause**, is the apprehending or reſtraining one's perſon, in order to be forthcoming to anſwer an alledged crime. To this arreſt all perſons whatſoever are, without diſtinction, equally liable; and doors may be broken open to arreſt the offender; but no man is to be arreſted, unleſs charged with ſuch a crime as will at leaſt juſtify holding him to bail when taken. There is this difference alſo between arreſts in civil and criminal caſes, that none ſhall be arreſted for debt, treſpaſs, or other cauſe of action, but by virtue of a precept or commandment out of ſome court; but for treaſon, felony, or breach of the peace, any man may arreſt with or without warrant or precept. Arreſts by private perſons are in ſome caſes commanded. Perſons preſent at the committing of a felony muſt uſe their endeavours to apprehend the offender, under penalty of fine and impriſonment; and they are alſo, with the utmoſt diligence, to purſue and endeavour to take all thoſe who ſhall be guilty thereof out of their view, upon a hue and cry levied againſt them. Arreſts, by public officers, as watchmen, conſtables, &c. are either made by their own authority, which differs but very little from the power of a private perſon; or they are made by a warrant from a juſtice of peace. See **Warrant.**

Arrest of Judgment, in law, the aſſigning juſt reaſon why judgment ſhould not paſs: as, want of notice of the trial; a material defect in the pleading; when the record differs from the deed impleaded; when perſons are miſnamed; where more is given by the verdict than is laid in the declaration, &c. This may be done either in criminal or civil cauſes.

To **Arrest**, *v. a.* 1. To ſeize by a mandate from a court or officer of juſtice. See **Arrest.**—2. To ſeize any thing by law.—3. To ſeize; to lay hands on; to detain by power.—4. To withhold; to hinder.—5. To ſtop motion.—6. To obſtruct; to ſtop.

ARRET, a decree; the deciſion of a ſovereign court.

To **ARRIDE**, *v. a.* 1. To laugh at.—2. To ſmile; to look pleaſantly upon one.

ARRIVAL, *n. s.* the act of coming to any place; and, figuratively, the attainment of any purpoſe.

To **ARRIVE**, *v. n.* 1. To come to any place by water.—2. To reach any place by travelling.—3. To reach any point.—4. To gain any thing, by progreſſive approach.

ARROGANCE, } *n. s.* the act or quality of taking much
ARROGANCY, } upon one's ſelf; that ſpecies of pride which conſiſts in exorbitant claims.

ARROGANT, *adj.* given to make exorbitant claims; haughty; proud.

ARROGANTLY, *adv.* in an arrogant manner.

To **ARROGATE**, *v. a.* to claim vainly; to exhibit unjuſt claims only prompted by pride.

ARROGATION, *n. s.* a claiming in a proud unjuſt manner.

ARROW, *n. s.* the pointed weapon which is ſhot from a bow. See **Archery.**

Arrow, in aſtronomy, trigonometry, &c. See **Sagitta.**

Arrow, in fortification, is a work placed at the ſalient angles of the glacis, and conſiſts of two parapets, each forty toiſes long. This work has a communication with the covert way, of about 24 or 30 feet broad, called *caponier*; and a ditch before it, of five or ſix toiſes. See **Fortification.**

Arrow, in ſurveying, is uſed for ſmall ſtraight ſticks about two feet long, ſhod with iron ferrils. Their uſe is to ſtick into the ground at the end of the chain.

Arrow-head, *n. s.* a water plant, ſo called from the reſemblance of its leaves to the head of an arrow.

Arrow-head, in botany. See **Sagittaria.**

ARROWY, *adj.* conſiſting of arrows.

ARSE, *n. s.* the buttocks, or hind part of an animal.

ARSENAL, *n. s.* a repoſitory of things requiſite to war; a magazine of military ſtores.

ARSENIC, *n. s.* a heavy opake ſubſtance, uſually ſold in white maſſes, which, when broken, diſcover a ſemi-tranſparency ſomewhat reſembling that of ſal ammoniac, but by expoſure to the air become white and opake like the outſide of the original maſs. By various chemical proceſſes it may be made to aſſume the appearance either of an acid ſalt or metal, at the pleaſure of the operator; and therefore has been conſidered both as a ſaline ſubſtance and a ſemi-metal. Avicenna, who lived in the 11th century, is the firſt who expreſsly mentions white arſenic, as well as its ſublimate. It is not known by whom arſenic was firſt reduced to a metallic form. Paracelſus aſſerts that arſenic, ſublimed with egg-ſhell lime becomes like ſilver; and in 1675, M. Limeri makes mention of a method of ſubliming arſenic with fixed alkali and ſoap.

The true nature of arſenic being little known, it is no wonder to find chemiſts differing very much as to the claſs of natural bodies in which it ought to be placed. Avicenna and a great number of others claſs it with the ſulphurs; Albertus Magnus and his followers, among the ſalts. Becher conſiders it as a kind of ſoap, or ſaline ſulphureous body. Latter experiments, however, have made it evident, that white arſenic conſiſts of an acid united to phlogiſton; and that by diminiſhing the latter, the acid becomes more and more apparent; while, on the contrary, by augmenting the quantity of phlogiſtic matter, the arſenic aſſumes the metallic form. With reſpect to the ſulphureous nature of arſenic, it appears indeed that the regulus itſelf, as well as orpiment and realgar, are inflammable ſubſtances; but it is not ſo with white arſenic. This inflammability, therefore, which arſenic in a certain ſtate has in common with zinc and ſeveral other ſubſtances, will not denominate it ſulphureous, any more than thoſe of other bodies, which poſſeſs the common property of inflammability can be denominated *sulphurs*.

It is commonly ſaid that arſenic mineralizes metals; and therefore, ſays Mr. Bergman, it is conſidered as a ſulphur by ſome, who yet extend the idea of mineralization ſo far, as under it to comprehend all mixtures of which metals make a part. But if we examine this ſignification a little more accurately, we ſhall ſee it is extended too far; for if this be admitted, we muſt at the ſame time allow, that no native metal is to be found. Thus the gold called *native*, is ſeldom if ever found pure, but more or leſs mixed with copper or ſilver; and ſo with other metals. If, therefore, arſenic, which, unleſs in its reguline ſtate, never diſſolves other metals, be conſidered as a mineralizing ſubſtance, what hinders us from ſaying that gold is mineralized by ſilver or copper, and in general every metal mineralized by ſome other? It is much more natural to ſuppoſe that thoſe metals are mineralized which are actually diſſolved and concealed by a menſtruum. Sulphur is the chief agent employed by nature for this purpoſe; and though the acids of vitriol, phoſphorus, nitre, and ſometimes even the aerial acid, occaſion the metals to put on an appearance foreign to their nature, yet the number of theſe is ſo ſmall, that, compared with the ſulphurated minerals, they almoſt vaniſh. This mineral, ſo troubleſome to the mineralogiſt, occaſioned the alchemiſts to ſuſpect the exiſtence of a certain arſenical principle indiſpenſable to the perfection of every metal. Even ſo late as 1773, a queſtion to this purpoſe was propoſed by the Royal Academy of Sciences at Berlin: the prize was adjudged to M. Monnet, who in his anſwer conſidered arſenic as a ſemi-metal of a peculiar kind, which is ſo far from conſtituting any eſſential part of metals, that its preſence is always attended with inconveniences, either by carrying off the metal as it flies away, or ſpoiling the maſs in which it remains. Theſe conſiderations, however, do not hinder us from aſſerting that the acid of arſenic, like others, is a mineralizing ſubſtance, if at any time it happens to meet with metals in the bowels of the earth, and to unite with it in that form. Arſenic in its pure ſtate is well known to be a moſt deſtructive and deadly poiſon, for which the art of medicine has ſcarcely as yet afforded a cure. Mr. Bergman is of opinion that it acts as an highly corroſive acid, even when applied externally. He alſo tells us, that the dry acid is more deſtructive than white arſenic; the regulus and realgar leſs ſo. From an experiment of Mr. Scheele, however, in which 8 grains of arſenical acid were given to a cat, it does not appear that it acts more violently than white arſenic. The extreme danger attending this ſubſtance when taken into the human body, ariſes from its inſolubility, and the difficulty of decompounding it; for there can but little danger ariſe from a liquid, unleſs, like corroſive acids, it ſhould at once burn the ſubſtance of the ſtomach like fire; or like laurel water ſuſpend the action of the nervous ſyſtem. Corroſive ſublimate, ſolutions of mercury in aquafortis, &c. will as certainly poiſon as arſenic; but they are much leſs difficult to cure, becauſe any alkaline ſubſtance will certainly decompound them and deſtroy their deleterious efficacy. Arſenic, on the contrary, cannot be decompounded, nor united with any known ſubſtance, at leaſt in ſuch a ſhort time as the exigence of the caſe we ſpeak of would require, without a conſiderable degree of heat. It therefore remains in the ſtomach, continually exerting its miſchievous qualities, unleſs it can be diſcharged by vomiting.

The ſymptoms attending arſenic when ſwallowed are, nauſea, ſickneſs, and retching to vomit, about half an hour after it is taken. Theſe are followed by violent vomitings, hiccups, and pains in the ſtomach and bowels. Convulſions and palſies of the limbs preſently ſucceed, with intenſe heats, cold ſweats, palpitations of the heart, extreme anxiety, proſtration of ſtrength, thirſt and dryneſs of the mouth and throat, loſs of reaſon, and at laſt death. If the quantity taken was conſiderable, the patient dies in ſeven or eight hours after taking it; and the ſtomach and inteſtines are found, upon diſſection, to be corroded and perforated. When this is not the caſe, violent putrefactive ſymptoms ſoon enſue after arſenic is ſwallowed; for the bodies of thoſe who are poiſoned by it generally have abundance of red or purple ſpots even before death. It remarkably inflames the coats of the ſtomach, and the putrefaction is ſaid particularly to take place in the genitals of men. Mr. Bergman relates, that in the body of a man who was poiſoned with arſenic, and diſſected in the anatomical theatre at Upſal, the putrefaction had been ſo ſtrong, that the mineral was deprived of part of its phlogiſton, and emitted the garlic ſmell, that peculiar characteriſtic of arſenic when in this ſituation.

Many antidotes have been propoſed againſt this dreadful poiſon by authors of the higheſt reputation; but it is to be feared, without that ſucceſs which the confidence of thoſe who propoſed them ſeemed to enſure. Indeed, previous to any great hope of ſucceſs in this reſpect, it ought to be ſhown that theſe antidotes are able to effect ſome conſiderable change on arſenic when out of the body; and that not in ſolution, but when in a powder not very fine, as in the caſe with arſenic when it is uſually taken. Mr. Bergman recommends alkalies in diſeaſes occaſioned by arſenic: Nay, he tells us, that "ſince phlogiſton and alkalies are the moſt powerful correctors of acid acrimony, it will *readily occur*, how it may be mitigated, and its deleterious effects obviated." But the many fatal accidents conſequent on taking this mineral, ſhow that none of thoſe are to be depended upon.—Bergman himſelf indeed cautions us againſt truſting to phlogiſton correctors alone; and perhaps, the ſolution of hepar ſulphuris, which contains the united powers of both the alkaline and phlogiſtic antidotes united, might prove more efficacious than either of them ſingly. Oils, fats, milk, warm fat broths, freſh butter, &c. have all been recommended; and, no doubt, in ſuch deplorable caſes, are thoſe remedies to which we can moſt readily have recourſe: but, even here, it is evident, that their efficacy muſt be exceedingly dubious, whatever their intrinſic virtues may be; and for this plain reaſon, that the arſenic is already in contact with the ſtomach, and though the remedies might have prevented its action, had they been *firſt* ſwallowed, their operation muſt be much leſs powerful after the poiſon has had acceſs to the ſtomach, and begun to exert its pernicious effects.

Arsenic, medical prescriptions of. Notwithſtanding the dreadful effects of arſenic, when taken in a large quantity, attempts have not been wanting to introduce it into the materia medica. The diſeaſe, indeed, in which they have been recommended, (the cancer) is of a very incurable nature, at leaſt by ordinary medicines.—M. le Febure, a French phyſician, ſome time ago publiſhed a treatiſe, in which he recommended pure white arſenic, as a ſpecific in that diſtemper. The doſe was four French grains, equal to 3½ Engliſh, diſſoved in a French pint (32 troy ounces) of diſtilled water. A table ſpoonful of this ſolution is to be taken with an equal quantity of milk, and half an ounce of ſyrup of poppies, every morning faſting, and taking care to taſte nothing for an hour after. This courſe muſt be continued eight days; after which, a doſe is to be taken twice every day in the ſame manner, one in the morning, and another at twelve at night. At the end of a fortnight, three doſes may be exhibited daily, the third being taken at mid-day.—Thus people of a weakly conſtitution may continue till the cure is completed; but ſuch as are more robuſt, may gradually augment the doſe, till two table ſpoonfuls are taken at each time, with as much milk, and half an ounce of ſyrup of poppies. Children muſt on no account take more than three tea ſpoonfuls a day, with a proportional quantity of ſyrup of poppies. For adults, the ſtrength of the ſolution, as well as the quantity, is to be augmented; ſix grains being put into the ſecond bottle, and eight into the third; and a purgative, compoſed of manna, rhubarb, and ſal ſeignette, is to be given every eight or twelve days. An iſſue he conſiders as uſeful in every caſe. The tumour, if not ulcerated, ought to be waſhed with a ſolution of arſenic, in the proportion of eight grains to a pint; and he adviſes the following cataplaſm. "Take of carrot juice one pound, of ſugar of lead half an ounce, of liquid laudanum a dram and an half; form the whole into a maſs with as much powder of hemlock as is ſufficient for the purpoſe. The tumour is to be covered to a moderate thickneſs with this cataplaſm, which is to be kept on by a diachylon plaſter." When the cancer is of the ulcerated kind, he directs the ichorous ſeroſity to be taken away by means of dry *charpee* at each dreſſing, and the ſore to be fomented with the arſenical ſolution with the chill taken off it, and having about a third part of red wine added to it. When the ſore is of a very bad kind, he propoſes the arſenic to be diſſolved in a decoction of bark for the purpoſe of fomentation; after which, the cataplaſm and plaſter are to be applied, and this is to be renewed every twelve hours. M. Le Febure aſſerts, that the arſenic, when taken with the precautions juſt mentioned, is not attended with any bad conſequences, nor has it a diſagreeable taſte. Its action is ſcarcely perceived on any of the ſecretions or excretions; though ſome diſcharge their urine more freely than uſual, and with ſome the belly is more looſe. In ſome, the perſpiration is more copious; but theſe effects are neither regular nor conſtant. He does not conſider it as an infallible cure for the diſtemper in every poſſible ſtage; but thinks, that the diſeaſe is incurable, when, in its progreſs, it has eroded a blood-veſſel, and occaſioned a conſiderable hemorrhagy; alſo when the patient is of a hectic or phthiſical habit of body. With reſpect to regimen, he directs whey, with twelve grains of nitre to the bottle, or a weak decoction of althea, with an equal quantity of nitre; and to abſtain from wine and fermented liquors. Broth made with beef, veal, or chicken, is alſo proper. Mr. Bergman informs us, that "it can hardly be doubted but arſenic may be applied to valuable purpoſes in medicine, and experiments have long ago put that out of doubt; but with reſpect both to its doſe and preparation, the utmoſt caution is neceſſary."

Dr. Black, however, has ſeen the internal exhibition of arſenic, in thoſe caſes where it is recommended by foreign phyſicians, attended with very dangerous conſequences, ſuch as hectics, &c. He has likewiſe known obſtinate ulcers healed by it. Yet though the external uſe of arſenic has proved ſucceſsful in ſome caſes, it has often, even in this way, produced very terrible conſequences: ſo that the Doctor, far from recommending the internal uſe of it, reprobates it even in external applications.

ARSENIC, MEDICAL USE OF, PROVED BENEFICIAL. The following account of the uſe of arſenic in medicine, is given by Dr. Andrew Duncan. "Notwithſtanding, however, the very violent effects of arſenic, it has been employed in the cure of diſeaſes, both as applied externally and as taken internally. Externally, white arſenic has been chiefly employed in caſes of cancer; and, as uſed in this way, it is ſuppoſed, that its good effects depend on its acting as a peculiar corroſive: and it is imagined, that arſenic is the baſis of a remedy long celebrated in cancer, which, however, is ſtill kept a ſecret by a family of the name of Plunket, in Ireland. According to the beſt conjectures, their application conſiſts of the powder of ſome vegetables, particularly the ranunculus flammeus, and cotula fœtida, with a conſiderable proportion of ſulphur, intimately mixed together. This powder, made into a paſte with the white of an egg, is applied to the cancerous part, which it is intended to corrode; and being covered with a thin piece of thin bladder, ſmeared alſo with the white of an egg, it is ſuffered to lie on from 24 to 48 hours; and afterwards, the eſchar is to be treated with ſoftening digeſtive, as in other caſes. Arſenic, in ſubſtance, to the extent of an eighth of a grain for a doſe, combined with a little of the flowers of ſulphur, has been ſaid to be employed internally, in ſome very obſtinate caſes of cutaneous diſeaſes, and with the beſt effect. But of this we have no experience. Of all the diſeaſes in which white arſenic has been uſed internally, there is no one in which it has been ſo frequently and ſo ſucceſsfully employed as in the cure of intermittent fevers. It has long been uſed in Lincolnſhire, and ſome other of the fenny counties of England, under the name of the *arſenic drop*, prepared in different ways: And it is conjectured, that an article, which has had a very extenſive ſale, under the title of the *taſteleſs ague-drop*, the form of preparing which, however, is ſtill kept a ſecret, is nothing elſe but a ſolution of arſenic. But whether this be the caſe or not, we have now the moſt ſatisfactory information concerning this article, in the "Medical Reports, of the effects of Arſenic, in the cure of agues, remitting fevers, and periodic head-achs," by Dr. Fowler, of Stafford. He directs, that 64 grains of arſenic, reduced to a very fine powder, and mixed with as much fixed vegetable alkaline ſalt, ſhould be added to half a pound of diſtilled water in a Florence flaſk; that it ſhould be then placed in a ſand heat, and gently boiled, till the arſenic be completely diſſolved; that after the ſolution is cold, half an ounce of compound ſpirit of lavender be added to it, and as much diſtilled water, as to make the whole ſolution amount to a pound. This ſolution is taken in doſes, regulated according to the age, ſtrength, and other circumſtances of the patient, from two to twelve drops, once, twice, or oftener, in the courſe of the day. And in the diſeaſes mentioned above, particularly in intermittents, it has been found to be a ſafe and very efficacious remedy, both by Dr. Fowler, and by other practitioners: but in ſome inſtances, even when given in very ſmall doſes, we have found it excite violent vomiting. But beſides this, it has alſo been alledged by ſome, that thoſe cured of intermittents by arſenic are very liable to become phthiſical. If arſenic ſhall ever be extenſively employed internally, it will probably be moſt certain, and moſt ſafe in its operation, when brought to the ſtate of a ſalt, readily ſoluble in water."

As phyſicians are often called, in caſes where it is ſuſpected, that people have died from the effects of arſenic taken internally, Dr. Black gives the following directions to the phyſician who happens to be employed. "He ſhould anſwer every queſtion put to him with caution, as the lives and reputations of many often depend on his opinions. The firſt queſtion uſually put is, whether, from the ſymptoms of the patient, or the appearance of the body after death, he imagines the deceaſed died by being poiſoned with arſenic? The ſymptoms attending the taking of arſenic are, in about a quarter of an hour, ſickneſs at ſtomach, ſucceeded by vomiting, purging, burning pain in the bowels, heat and thirſt, pains and cramps in the legs and thighs, ſyncope, and death. When the body is examined, the inteſtines appear inflamed and corroded; nay, ſome ulcerations appear about the anus, even before death. But we muſt take care not to be deceived by eroſions of the ſtomach occaſioned by the gaſtric juice, which has a power of diſſolving the ſtomach after death. The difference is, that the arſenic occaſions inflammation and blackneſs, whereas none appears in the other caſe. If the perſon eſcapes, he is in danger of being afflicted by maraſmus, paralytic affections of the limbs, great debility, &c. The ſecond generally aſked is, whether any arſenic has been found in the inteſtines? The method of diſcovering this is as follows. The contents of the ſtomach and inteſtines ſhould be taken out and waſhed in water; and any powder it contains, ſuffered to ſeparate. If any arſenic be mixed with it, it will fall to the bottom, and muſt then be examined by the following methods. I. By laying it on a red-hot iron. If it be arſenic, it will evaporate, without melting, in a thick white vapour; and this may be ſhown by the 40th part of a grain. II. We may mix ſome of it with charcoal: in which ſtate, if it be arſenic, it will emit an odour very like garlic; but this will not be perceived, unleſs it be mixed with charcoal, or ſome inflammable matter. III. We may incloſe the powder with ſome charcoal, between two poliſhed bits of copper, the edges of which are moiſtened with a lute made of two parts of fine ſand, and one of pipe clay. The plates being then bound together with a wire, and the whole made red-hot, the arſenical powder will thus be metallized, and, penetrating the copper, a blackiſh ſkin will firſt appear upon it; which being rubbed off, the parts which the arſenical vapour has touched will appear of a whitiſh or lead colour. IV. We may metallize or reduce the arſenic in a glaſs tube, by means of the black flux. This is eaſily done, by mixing two or three parts of the flux with one of the powder. This mixture being put into a ſmall glaſs tube, and a heat applied ſufficient for volatilizing the arſenic, the greateſt part of it will be metallized. One end of the tube is to be left open at firſt, and then ſtopped with lint or wool; the other made red-hot; and if the tube be then broken, the arſenic is found metallized. One grain of arſenic will be ſufficient for all thoſe experiments." The firſt ſymptoms which enſue on the taking of arſenic, ſhow that it is of a highly inflammatory, cauſtic, and corroſive nature with regard to the ſyſtem in general, and the inteſtines in particular: the pulſe becomes extremely weak and irritable, and this is attended with a kind of paralytic affection of the limbs, maraſmus, &c. Milk and oil have been recommended as antidotes; but the milk may curdle, and the oil will not mix with the fluids in the inteſtines. It is therefore adviſable, when a phyſicians is called to a patient who has ſwallowed arſenic, to make uſe of mucilages. A friend of Dr. Black, who had no mucilage at hand, thought of the whites of eggs, and ſucceeded. After the violence of the firſt attack is over, a milk diet, opiates, &c. are proper; and ſome time after, electricity has been found of great ſervice. Some have adviſed to exhibit hepar ſulphuris, as already noticed: but this is founded, not on experience, but theory; and it cannot be ſuppoſed, that ſuch a quantity can enter the ſyſtem, as will be ſufficient for neutralizing the arſenic, and converting it into orpiment, which is the deſign of exhibiting it.

ARSENIC, VARIOUS USES OF. With regard to the other uſes of arſenic, Dr. Duncan obſerves, that "philoſophers are wont to evince the extraordinary poroſity of bodies, and the wonderful ſubtility of vapours, by a ſympathetic ink made with orpiment and lime (ſee INK SYMPATHETIC), for writing, made with vinegar of litharge, by itſelf inviſible, expoſed to the vapour of this liquor becomes in a few minutes brown, even though a great many folds of paper be interpoſed. Wines naturally acid, or grown ſo by age, ſtill continue to be edulcorated by lead, notwithſtand the puniſhments attending the detection of this fraud: It is therefore of great conſequence to be in poſſeſſion of an eaſy method of diſcovering ſuch a ſophiſtication. For this purpoſe, a probatory liquor has been recommended, compoſed of cauſtic fixed alkali and orpiment; which inſtantly throws down a black or dark brown precipitate in conſequence of the union of the ſulphur of the orpiment with the metal. The ſame effect will take place on the addition of common hepar ſulphuris; but methods have been contrived of eluding this proof. If a ſmall quantity of chalk be contained in the wine, the ſaline hepar does not produce the intended effect; for the falling of the white calcareous earth diminiſhes the blackneſs. The other probatory liquor is alſo rendered ineffectual by a large quantity of tartar; becauſe the tartareous acid, uniting with the lime, forms a kind of ſelenite, which in like manner diminiſhes the blackneſs. Arſenic ſometimes enters metallic compoſitions, eſpecially copper and tin; but it were much to be wiſhed that ſuch compoſitions were baniſhed, at leaſt from the kitchen. Shot made of lead is ſometimes hardened by orpiment. Regulus of arſenic enters into the compoſition of Meuder's phoſphorus. The power of the calx in vitrification was long ago known to Geber; and it is frequently employed in glaſs-houſes, either for facilitating fuſion, for acquiring a certain degree of opacity, or finally for carrying off phlogiſton. The method in which mountain cryſtals, placed over orpiment, white arſenic, crude antimony, and ſal ammoniac, mixed in a crucible, are tinged by means of heat, is deſcribed by Neri, and upon trial is found to be true. I have thus obtained theſe cryſtals beautifully marked with red, yellow, and oval ſpots; but at the ſame time cracked, which could ſcarcely be avoided. In painting, too, the artiſts ſometimes employ arſenic. Painters in oil frequently uſe both orpiment and realgar; and it is probable that wood covered with a pigment mixed with white arſenic would not be ſpoiled by worms.—A moſt beautiful green pigment may be precipitated from blue vitriol by means of white arſenic diſſolved in water, together with vegetable alkali. This prepared either with water or oil, affords a colour which ſuffers no change in many years.—The playthings of children, however, ſhould not be painted with this or any other preparation of arſenic, on account of their cuſtom of putting every thing into their mouths." Arſenic is alſo uſed in dyeing, and the yellow combination of it with ſulphur has the property of readily diſſolving indigo; for which purpoſe it is uſed in cloth-printing. It lets it fall again, however, on expoſure to the air; and therefore can be employed only in pencil-colours, where a large quantity is laid on at once. The neutral arſenical ſalt is uſed in ſome manufactures in France; but for what purpoſes is not known.

ARSENIC, OIL OF or **CAUSTIC OIL OF ARSENIC**, is a butyrous liquor, like butter of antimony, prepared of arſenic, and corroſive ſublimate, being a combination of marine acid with the arſenic. It ſerves to eat off fungous fleſh, and to cleanſe carious bones, &c.

ARSENIC, REGULUS OF, is the moſt fixed and compact part of it, prepared by mixing it with pot-aſhes and ſoap, then fuſing the whole, and caſting it into a mortar; upon which the heavieſt part falls to the bottom.

ARSENIC, YELLOW, or **NATIVE**, is called *orpiment*. Our yellow and red arſenic are artificial, being only white arſenic mixed with different proportions of ſulphur. The white is the ſtrongeſt, the yellow is weaker, and the red weakeſt. White arſenic, ſublimed with one tenth of its weight of ſulphur, is yellow; and with one fifth it is red. Both the yellow and the red foſſil arſenics, when of a ſmooth texture, are called ZARNICHS; but when compoſed of ſmall ſcales or leaves, they are called *auripigmenta*, or *orpiments*.

ARSENICAL, *adj.* containing *arsenic;* conſiſting of arſenic.

ARSON, in Engliſh law, is the malicious and wilful burning the houſe or out-houſe of another man; which is felony at common law.

ART, *n. s.* 1. The power of doing ſomething not taught by nature and inſtinct.—2. A ſcience; as, the liberal *arts.*—3. A trade.—4. Artfulneſs; ſkill; dexterity.—5. Cunning.—6. Speculation. Art is defined by Lord Bacon, a proper diſpoſal of the things of nature by human thought and experience, ſo as to anſwer the ſeveral purpoſes of mankind: in which ſenſe, *art* ſtands oppoſed to *nature*. Art is principally uſed for a ſyſtem of rules ſerving to facilitate the performance of certain actions; in which ſenſe it ſtands oppoſed to *science*, or a ſyſtem of ſpeculative principles.

Arts are commonly divided into USEFUL, or MECHANIC, and LIBERAL, or POLITE. The former are thoſe wherein the *hand* and *body* are more concerned than the mind: of which kind are moſt of thoſe which furniſh us with the NECESSARIES of life, and are commonly known by the name of TRADES; as baking, brewing, weaving, &c.—The latter are ſuch as depend more on the labour of the mind than that of the hand; they are the produce of the IMAGINATION, their eſſence conſiſts in EXPRESSION, and their end is PLEASURE. Of this kind are poetry, painting, muſic, &c.

PROGRESS OF THE ARTS. Some uſeful arts muſt be nearly coeval with the human race; for food, cloathing, and habitation, even in their original ſimplicity, require ſome art. Many other arts are of ſuch antiquity as to place the inventors beyond the reach of tradition. Several have gradually crept into exiſtence without an inventor. The buſy mind, however, accuſtomed to a beginning in things, cannot reſt till it finds or imagines a beginning to every art. The moſt probable conjectures of this nature the reader may ſee in the hiſtorical introductions to the different articles. In all countries where the people are barbarous and illiterate, the progreſs of arts are extremely ſlow. It is vouched by an old French poem, that the virtues of the loadſtone were known in France before the year 1180. The mariner's compaſs was exhibited at Venice, A. D. 1260, by Paulus Venetus, as his own invention. John Goya of Amalphi was the firſt who, many years afterwards, uſed it in navigation; and alſo paſſed for being the inventor. Though it was uſed in China for navigation long before it was known in Europe, yet to this day it is not ſo perfect as in Europe. Inſtead of ſuſpending it in order to make it act freely, it is placed upon a bed of ſand, by which every motion of the ſhip diſturbs its operation! Hand-mills, termed *querns*, were early uſed for grinding corn; and when corn came to be raiſed in greater quantity, horſe-mills ſucceeded. Water mills for grinding corn are deſcribed by Vitruvius. Wind-mills were known in Greece and in Arabia as early as the 7th century; and yet no mention is made of them in Italy till the 14th, nor were they known in England till two centuries after. The ancients had mirror glaſſes, and employed glaſs to imitate cryſtal vaſes and goblets; yet they never thought of uſing it in windows. In the 13th century, the Venetians were the only people who had the art of making cryſtal glaſs for mirrors. A clock that ſtrikes the hours was unknown in Europe till the end of the 12th century. And hence the cuſtom of employing men to proclaim the hours during night; which cuſtom is kept up by the watchmen in many cities even to this day. Galileo was the firſt who conceived an idea that a pendulum might be uſed for meaſuring time; and Huygens was the firſt who put the idea in execution, by making a pendulum clock. Hook, in 1660, invented a ſpiral ſpring for a watch, though a watch was far from being a new invention. Paper was made no earlier than than the 14th century; and the invention of printing was a century latter. Silk manufactures were long eſtabliſhed in Greece before ſilk worms were introduced there. The manufacturers were provided with raw ſilk from Perſia: but that commerce being frequently interrupted by war, two monks, in the reign of Juſtinian, brought eggs of the ſilk worm from Hindoſtan, and taught their countrymen the method of managing them. The art of reading made a very ſlow progreſs. To encourage that art in England, the capital puniſhment of murder was remitted, if the criminal could but read, which in law language is termed *benefit of clergy.* One would imagine that the art muſt have made a very rapid progreſs when ſo greatly favoured: but there is a ſignal proof of the contrary; for ſo ſmall an edition of the Bible as 600 copies, tranſlated into Engliſh in the reign of Henry VIII. was not wholly ſold off in three years.

The exertion of national ſpirit upon any particular art, promotes activity to proſecute other arts. The Romans, by conſtant ſtudy, came to excel in the art of war, which led them naturally to improve upon other arts. Having, in the progreſs of ſociety, acquired ſome degree of taſte and poliſh, a talent for writing broke forth. Nevius compoſed in verſe ſeven books of the Punic war; beſides comedies, replete with bitter raillery againſt the nobility. Ennius wrote annals, and an epic poem. Lucius Andronicus was the father of dramatic poetry in Rome. Pacuvius wrote tragedies; Plautus and Terence, comedies. Lucilius compoſed ſatires; Fabius, Pictor, Cincius Alimentus, Piſo Frugi, Valerius Antius, and Cato, were rather annaliſts than hiſtorians, confining themſelves to naked facts, ranged in order of time. The genius of the Romans for the fine arts was much inflamed by Greek learning when free intercourſe between the two nations was opened. Many of thoſe who made the greateſt figure in the Roman ſtate commenced authors; Cæſar, Cicero, &c. Sylla compoſed memoirs of his own tranſactions, a work much eſteemed even in the days of Plutarch. The progreſs of art ſeldom fails to be rapid, when a people happen to be rouſed out of a torpid ſtate by ſome fortunate change of circumſtances. Proſperity, contraſted with former abaſement, gives to the mind a ſpring which is vigorouſly exerted in every new purſuit. The Athenians made but a mean figure under the tyranny of Piſiſtratus; but upon regaining their freedom and independence, they were converted into heroes. Miletus, a Greek city of Ionia, being deſtroyed by the king of Perſia, and the inhabitants made ſlaves, the Athenians, deeply affected with the miſery of their brethren, boldly attackad the king in his own dominions, and burnt the city of Sardis. In leſs than ten years after, they gained a ſignal victory at Marathon; and, under Themiſtocles, made head againſt that prodigious army with which Xerxes threatened utter ruin to Greece. Such proſperity produced its uſual effect: arts flouriſhed with arms, and Athens became the chief theatre for ſcience as well as for the fine arts. The reign of Auguſtus Cæſar, which put an end to the rancour of civil war, and reſtored peace to Rome with the comforts of ſociety, proved an auſpicious æra for literature; and, produced a cluſter of Latin hiſtorians, poets, and philoſophers, to whom the moderns are indebted for their taſte. One who makes a figure rouſes emulation in all: one catches fire from another, and the national ſpirit is every where triumphant: claſſical works are compoſed, and uſeful diſcoveries made in every art and ſcience. It is true, that the Roman government under Auguſtus was in effect deſpotic: but deſpotiſm, in that ſingle inſtance, made no obſtruction to literature, it having been the policy of that reign to *hide the tyranny* as much as poſſible.

The reſtoration of peace to the United States, after the tedious war, by which their independence was eſtabliſhed, has promoted improvements of every kind; and ſince that period arts and induſtry have made an aſtoniſhing progreſs. It is true, that in this reſpect we are far behind moſt of the European nations; but when the various obſtacles which tended to impede our progreſs is conſidered, the man of reflection will rather be ſurpriſed that ſo much has been effected, than that a great deal ſtill remains to be done.

In a country thinly peopled, where even neceſſary arts want hands, it is common to ſee one perſon exerciſing more arts than one: in ſeveral parts of America, one man acts as a phyſician, ſurgeon, and apothecary; and formerly in various parts of Europe the trade of a barber was conjoined with theſe profeſſions. But in every populous country, even ſimple arts are ſplit into parts, and each part has an artiſt appropriated to it. In mechanic arts that method has its advantages and diſadvantages. As a hand confined to a ſingle operation becomes both expert and expeditious, a mechanic art is perfected by having its different operations diſtributed among the greateſt number of hands. Many hands are employed in making a watch, and a ſtill greater number in manufacturing a web of woollen cloth. But although this diviſion of labour, doubtleſs, tends to the perfection of the manufactures, it is attended with the worſt of conſequences to the artiſan. Various arts or operations, carried on by the ſame man, envigorate his *mind*, becauſe they exerciſe different faculties; and as he cannot be equally expert in every art or operation, he is frequently reduced to ſupply want of ſkill by thought and invention. Conſtant application, on the contrary, to a ſingle operation, confines the mind to a ſingle object, and excludes all *thought* and *invention:* in ſuch a train of life, the operator becomes dull and ſtupid, like a *beaſt of burden*. The difference is viſible in the manners of the people: in a country where, from want of hands, ſeveral occupations muſt be carried on by the ſame perſon, the people are knowing and converſable: in a populous country, where manufactures flouriſh, they are ignorant and unſociable.

Uſeful arts paved the way for fine arts. Men upon whom the former had beſtowed every convenience, turned their thoughts to the latter. Beauty was ſtudied in objects of ſight; and men of taſte attached themſelves to the fine arts, which multiplied their enjoyments and improved their benevolence. Sculpture and painting made an early figure in Greece; which afforded plenty of beautiful originals to be copied in theſe imitative arts. Statuary, a more ſimple imitation than painting, was ſooner brought to perfection: the ſtatue of Jupiter by Phidias, and of Juno by Polycletes, though the admiration of all the world, were executed long before the art of light and ſhade was known. Apollodorus, and Zeuxis his diſciple, who flouriſhed in the 15th Olympied, were the firſt who figured in the art. Another cauſe concurred to advance ſtatuary before painting in Greece, viz. a great demand for ſtatues of their gods. Architecture, as a fine art, made a ſlower progreſs. Proportions upon which its elegance chiefly depends, cannot be accurately aſcertained, but by an infinity of trials in great buildings; a model cannot be relied on: for a large and ſmall building, even of the ſame form, require different proportions.

From the fine arts mentioned, we proceed to LITERATURE. It is agreed by all antiquaries, that the firſt writings were in verſe, and that writings in proſe were of a much latter date. The firſt Greek who wrote in proſe was Pherecides Syrus: the firſt Roman was Appius Cæcus, who compoſed a declamation againſt Pyrrhus. The four books of the Chatah Bhade, which is the ſacred Book of Indoſtan, are compoſed in verſe ſtanzas; and the Arabian compoſitions in proſe followed long after thoſe in verſe. To account for that ſingular fact, many learned pens have been employed; but without ſucceſs. By ſome it has been urged, that as memory is the only record of events where writing is unknown, hiſtory originally was compoſed in verſe for the ſake of memory. The ſongs of the bards, being univerſally reliſhed, were certainly the firſt compoſitions that writing was employed upon; they would be carefully collected by the moſt ſkilful writers, in order to preſerve them in perpetual remembrance. The ſucceeding part of the progreſs is obvious. People acquainted with no written compoſition, but what was in verſe, compoſed in verſe their laws, their religious ceremonies, and every memorable tranſaction that was intended to be preſerved in memory by writing. But when ſubjects of writing multiplied, and became more and more involved; when people began to reaſon, to teach, and to harangue; they were obliged to deſcend to humble proſe: for to confine a writer or ſpeaker to verſe in handling ſubjects of that nature, would be a burden unſupportable. The proſe compoſitions of early HISTORIANS are all dramatic. A writer deſtitute of art is naturally prompted to relate facts, as he ſaw them performed: he introduces his perſonages as ſpeaking and conferring; and he himſelf relates what was acted, and not ſpoke. The hiſtorical books of the Old Teſtament are compoſed in that mode; and ſo addicted to the dramatic are the authors of thoſe books, that they frequently introduce God himſelf into the dialogue. At the ſame time, the ſimplicity of that mode is happily ſuited to the poverty of every language in its earlieſt periods. The dramatic mode has a delicious effect in expreſſing ſentiment, and every thing that is ſimple and tender. Read, as an inſtance of an ordinary incident becoming, by that means, extremely intereſting, Ruth, c. i. from the 8 to the 17. But the dramatic mode, however pleaſing, in many inſtances, becomes quite intolerable in a long hiſtory. In the progreſs of ſociety new appetites and new paſſions aroſe; men came to be involved with each other in various connections; incidents and events multiply, and hiſtory becomes intricate by an endleſs variety of circumſtances. Dialogue accordingly is more ſparingly uſed, and in hiſtory plain narration is mixed with it. Narration is as it were the ground-work; and dialogue is raiſed upon it, like flowers in embroidery. Homer is admitted by all to be the great maſter of that mode of compoſition. The narrative mode came in time ſo to prevail, that in a long chain of hiſtory, the writer commonly omits dialogue altogether. Early writers appear to have had little judgment in diſtinguiſhing capital facts from minute circumſtances, ſuch as can be ſupplied by the reader without being mentioned. The hiſtory of the Trojan war by Dares the Phrygian is a curious inſtance of that cold and creeping manner of compoſition. The Roman hiſtories before the time of Cicero are chronicles merely. Cato, Fabius Pictor, and Piſo, confined themſelves to naked facts. In the Auguſtæ Hiſtoriæ Scriptores we find nothing but a dry narrative of facts, commonly of very little moment, concerning a degenerate people, without a ſingle incident that can rouſe the imagination or exerciſe the judgment. The monkiſh hiſtories are all of them compoſed in this manner. The dry narrative being very little intereſting or agreeable, a taſte for embelliſhment prompted ſome writers to be copious and verboſe. Saxo Grammaticus, who in the 17th century compoſed in Latin a hiſtory of Denmark, ſurpriſingly pure at that early period, is extremely verboſe and full of tautologies. Such a ſtyle, at the beſt unpleaſant, is intolerable in a modern tongue, before it is enriched with a ſtock of phraſes for expreſſing aptly the great variety of incidents that enter into hiſtory. The perfection of hiſtorical compoſition, which writers at laſt attain to, after wandering through various imperfect modes, is a relation of intereſting facts, connected with their motives and conſequences. A hiſtory of that nature is a connected chain of cauſes and effects. The hiſtory of Thucydides, and ſtill more that of Tacitus, are ſhining inſtances of this mode.

ELOQUENCE was of a later date than the art of literary compoſition; for till the latter was improved, there were no models for ſtudying the former. Cicero's oration for Roſcius is compoſed in a ſtyle diffuſe and highly ornamented; which, ſays Plutarch, was univerſally approved, becauſe at that time the ſtyle in Aſia, introduced into Rome with its luxury, was in high vogue. But Cicero, in a journey to Greece, where he leiſurely ſtudied Greek authors, was taught to prune off ſuperfluities, and to purify his ſtyle, which he did to a high degree of refinement. He introduced into his native tongue a ſweetneſs, a grace, a majeſty, that ſurpriſed the world, and even the Romans themſelves. Eloquence triumphs in a popular aſſembly, makes ſome figure in a court of law compoſed of many judges; very little where there is but a ſingle judge, and none at all in a deſpotic government. Eloquence flouriſhed in the republics of Athens and of Rome; and makes ſome figure at preſent in the national legiſlature of the United States. The GREEK STAGE has been juſtly admired among all polite nations. The TRAGEDIES of Sophocles and Euripides in particular are by all critics held to be perfect in their kind, excellent models for imitation, but far above rivalſhip. That the Greek ſtage was ſo early brought to maturity, is a phenomenon not a little ſingular in the progreſs of arts. The Greek tragedy made a rapid progreſs from *Theſpis* to Sophocles and Euripides, whoſe compoſitions are wonderful productions of genius, conſidering that the Greeks at that period were but beginning to emerge from barbarity into a taſte for literature. The compoſitions of Eſchylus, Sophocles, and Euripides, muſt have been highly reliſhed among a people who had no idea of any thing more perfect. We judge by compariſon, and every work is held to be perfect that has no rival. But it ought to be kept in view, that it was not the dialogue which chiefly enchanted the Athenians, nor variety in the paſſions *repreſented*, nor perfection in the actors; but machinery and pompous decoration, joined with exquiſite muſic. That theſe particulars were carried to the greateſt height, we may conclude from the extravagant ſums beſtowed on them: the exhibiting a ſingle tragedy was more expenſive to the Athenians than their fleet or their army in any ſingle campaign. One would imagine, however, that theſe compoſitions were too ſimple to enchant for ever; as variety in action, ſentiment, and paſſion, is requiſite, without which the ſtage will not continue long a favorite entertainment: yet we find not a ſingle improvement attempted after the days of Sophocles and Euripides. The manner of performance, indeed, prevented any improvement. A fluctuation of paſſion and refined ſentiments would have made no figure on the Grecian ſtage. Imagine the diſcording ſcene between Brutus and Caſſius in Julius Cæſar to be there exhibited, or the handkerchief in the Moor of Venice: how ſlight would be their effect, when pronounced in a maſk, and through a pipe? The workings of nature upon the countenance, and the flections of voice expreſſive of various feelings, ſo deeply affecting in modern repreſentation, would have been entirely loſt. If a great genius had ariſen with talents for compoſing a pathetic tragedy in perfection, he would have made no figure in Greece. An edifice muſt have been erected of a moderate ſize: new actors muſt have been trained to act with a bare face, and to pronounce in their own voice. And after all, there remained a greater miracle ſtill to be performed, viz. a total reformation of taſte in the people of Athens. In one word, the ſimplicity of the Greek tragedy was ſuited to that manner of acting; and that manner excluded all improvements. It does not appear that the Greek COMEDY ſurpaſſed the tragedy in its progreſs towards perfection. Horace mentions three ſtages of Greek comedy. The firſt well ſuited to the rough manners of the Greeks, when Eupolis, Cratines, and Ariſtophanes wrote. Theſe authors repreſented on the ſtage real perſons, not even diſtinguiſhing their names: of which we have a ſtriking inſtance in a comedy of Ariſtophanes, called *The Clouds*, where Socrates is introduced, and moſt contemptuouſly treated. This ſort of comedy, ſparing neither gods nor men, was afterwards reſtrained by the magiſtrates of Athens, ſo far as to prohibit the naming of perſons on the ſtage. This led writers to do what is done at preſent: the characters and manners of known perſons were painted ſo much to the life, that there could be no miſtake; and the ſatire was indeed heightened by this regulation, as it was an additional pleaſure to find out the names that were meant in the repreſentation. This was termed the *middle comedy*. But as there ſtill remained too great ſcope for obloquy and licentiouſneſs, a law was made prohibiting real events or incidents to be introduced upon the ſtage. This law happily baniſhed ſatire againſt individuals, and confined it to manners and cuſtoms in general. Obedient to this law are the comedies of Menander, Philemon, and Diphilus, who flouriſhed about A. A. C. 300. And this is termed the *third ſtage* of Greek comedy. The comedies of Ariſtophanes which ſtill remain, err not leſs againſt taſte than againſt decency. But the Greek comedy is ſuppoſed to have been conſiderably refined by Menander and his cotemporaries. Their works, however, were far from perfection, if we can draw any conjecture from their imitator Plautus, who wrote about a century later. The ROMAN THEATRE, from the time of Plautus to that of Terence, made a rapid progreſs. Ariſtotle defines comedy to be "an imitation of light and trivial ſubjects, provoking laughter." The comedies of Plautus correſpond accurately to that definition: thoſe of Terence riſe to a higher tone. Nothing is more evident than the ſuperiority of Terence above Plautus in the art of writing; and, conſidering that Terence is a later writer, nothing would appear more natural, if they did not copy the ſame originals. It may be owing to genius that Terence excelled in purity of language and propriety of dialogue; but how can we account for his ſuperiority over Plautus in the conſtruction and conduct of a play? Plautus ſurely would not imitate the worſt conſtructed plays. This difficulty does not ſeem to have occurred to any of the commentators. Had the works of Menander and his cotemporaries been preſerved, they probably would have explained the myſtery; which for want of that light will probably remain a myſtery for ever. HOMER has for more than 2000 years been held the prince of POETS. Such perfection in an author who flouriſhed when arts were far ſhort of maturity, is truly wonderful. The nations engaged in the Trojan war are deſcribed by him as in a progreſs from the ſhepherd ſtate to that of agriculture. Frequent mention is made in the Iliad of the moſt eminent men being ſhepherds. Andromache, in particular, mentions ſeven of her brethren who were ſlain by Achilles as they tended their father's flocks. In that ſtate, garments of woollen cloth were uſed; but the ſkins of beaſts, the original clothing, were ſtill worn as an upper garment: every chief in the Iliad appears in that dreſs. Such indeed was the ſimplicity of that early period, that a *black ewe* was promiſed by each to the man who would undertake to be *a ſpy*. In times of ſuch ſimplicity, literature could not be far advanced; and it is a great doubt, whether there was at that time a ſingle poem of the epic kind for Homer to imitate or improve upon. Homer is undoubtedly a wonderful genius; his fire, and the boldneſs of his conceptions, are inimitable. But in that early age, it would fall little ſhort of a real miracle, to find ſuch ripeneſs of judgment, and correctneſs of execution, as in modern writers are the fruits of long experience, and progreſſive improvements. That Homer is far from being ſo ripe, or ſo correct, cannot eſcape the obſervation of any reader of taſte. One ſtriking particular is, in his digreſſions without end, which draw our attention from the principal ſubject. A third particular which merits cenſure, is an endleſs number of minute circumſtances, eſpecially in the deſcription of battles, where they are moſt improper. The capital beauty of an epic poem is, the ſelection of ſuch incidents and circumſtances as make a deep impreſſion, keeping out of view every thing trifling or familiar. An account of a ſingle battle employs the whole fifth book of the Iliad and a great part of the ſixth; yet in the whole there is no general action, but unknown warriors, whom we never heard of before, killed at a diſtance with an arrow or a javelin, and every wound deſcribed with anatomical accuracy. The whole 17th book is employed in the conteſt about the dead body of Patroclus, ſtuffed with minute circumſtances, below the dignity of an epic poem. In ſuch ſcenes the reader is fatigued with endleſs particulars; and has nothing to ſupport him but the melody of Homer's verſification.

Having traced the progreſs of the liberal arts toward maturity, the decline of theſe arts comes next in order. An art, in its progreſs toward maturity, is greatly promoted by emulation, but after arriving at maturity, its downfal is not leſs promoted by it. It is difficult to judge of perfection, but by compariſon; and an artiſt, ambitious to outſtrip his predeceſſors, cannot ſubmit to be an imitator, but muſt ſtrike out ſomething new, which, in an art advanced to ripeneſs, ſeldom fails to be a degeneracy. This cauſe of the decline of the fine arts may be illuſtrated by various inſtances. The perfection of vocal muſic is to accompany paſſion, and to enforce ſentiment. In ancient Greece, the province of Muſic was well underſtood; which, being confined within its proper ſphere, had an enchanting influence. The Latin opera, in its form, reſembles the Greek tragedy, from which it is copied; but very little in ſubſtance. In the latter, muſic being made ſubſervient to ſentiment, the dialogue is nervous and ſublime: in the former, the whole weight is laid on muſic; and the dialogue, devoid of ſentiment, is weak and ſpiritleſs. Reſtleſs man knows no medium, but will be attempting innovations without end. By the ſame ambition, architecture has viſibly declined from its perfection. The Ionic was the favorite order when architecture was in its height of glory. The Corinthian order came next; which, in attempting greater perfection, has deviated from the true ſimplicity of nature; and the deviation is ſtill greater in the Compoſite order. With reſpect to LITERARY productions, the firſt eſſays of the Romans were very imperfect. We may judge of this from Plautus, whoſe compoſitions are rude, though much admired by his cotemporaries, being the beſt that exiſted at that time. The exalted ſpirit of the Romans hurried them on to the grand and beautiful; and literary productions of all kinds were in perfection when Auguſtus reigned. In attempting ſtill greater perfection, the Roman compoſitions became a ſtrange jumble of inconſiſtent parts: they were tumid and pompous, like thoſe of not a few of our modern Engliſh authors; and, at the ſame time, full of antitheſes, conceit, and tinſel wit. Every thing *new* in the fine arts pleaſes, though leſs perfect than what we are accuſtomed to; and for that reaſon, ſuch compoſitions were generally reliſhed. We cannot diſcover, by what gradual ſteps writers, after the time of Auguſtus, deviated from the patterns that were before them; for no book for any moment after that time is preſerved, till we come down to Seneca, in whoſe works, nature and ſimplicity give place to artificial thought and baſtard wit. He was a great corrupter of the Roman taſte; and after him, nothing was reliſhed but brilliant ſtrokes of fancy, with very little regard to ſentiment: even Virgil and Cicero made no figure in compariſon. Lucan has a forced elevation of thought and ſtyle, very difficult to be ſupported; and, accordingly, he ſinks often into puerile reflections; witneſs his encomium on the river Po; which, ſays he, would equal the Danube, had it the ſame number of tributary ſtreams! Quintillian, a writer of true and claſſical taſte, who was protected and encouraged by Veſpaſian, attempted to ſtem the tide of falſe writing. His rhetoric is compoſed in an elegant ſtyle; and his obſervations contain every delicacy of the critical art. At the ſame time flouriſhed Tacitus, poſſeſſing a more extenſive knowledge of the nature of man, than any other author, ancient or modern, if Shakeſpeare be not excepted. His ſtyle is original, conciſe, compact, and comprehenſive; and, in what is properly called his *hiſtory*, perfectly correct and beautiful. He has been imitated by ſeveral, but never equalled by any. Brutus is ſaid to be the laſt of the Romans for love of liberty: Quintillian and Tacitus may be ſaid to be the laſt for literary genius. Pliny the Younger is no exception: his ſtyle is affected, turgid, and full of childiſh brilliancy. Seneca and Pliny are proper examples of writers who ſtudy *ſhow* more than ſubſtance, and who make ſenſe yield to ſound. The difference between theſe authors and thoſe of the Auguſtan age, reſembles the difference between Greek and Italian muſic. Muſic, among the Greeks, limited itſelf to the employment to which it is deſtined by nature, viz. to be the handmaid of ſenſe, to enforce, enliven, or ſweeten a ſentiment. In the Italian opera, the miſtreſs is degraded to be the handmaid; and harmony triumphs, with very little regard to ſentiment.—Another great cauſe that precipitates the downfal of every fine art is *deſpotiſm*. The reaſon is obvious; and there is a diſmal example of it in Rome, particularly with regard to eloquence. In the decline of that art, it became faſhionable to ſtuff harangues with poetical quotations, without any view but ornament. It happened unluckily for the Romans, and for the world, that the fine arts were at their height in Rome, and not much upon the decline in Greece, when deſpotiſm put an end to the republic. Auguſtus, it is true, retarded their fall, particularly that of literature; it being the policy of his reign to hide *deſpotiſm*, and to give his government an air of *freedom*. His court was a ſchool of urbanity, where people of genius acquired that delicacy of taſte, that elevation of ſentiment, and that purity of expreſſion, which characterize the writers of his time. He honoured men of learning, admitted them to his table, and was bountiful to them. The tyranny of Tiberius, and of ſubſequent emperors, broke at laſt the elevated and independent ſpirit of the brave Romans, reduced them to abject ſlavery, and left not a ſpark of genius. The ſcience of law is the only exception, as it flouriſhed even in the worſt of times: the Roman lawyers were a reſpectable body, and leſs the object of jealouſy than the men of power and extenſive landed property. Among the Greeks alſo, a conquered people, the fine arts decayed; but not ſo rapidly as at Rome; the Greeks, farther removed from the ſeat of government, being leſs within the reach of the Roman tyrants. During their depreſſion, they were guilty of the moſt puerile conceits: witneſs verſes compoſed in the form of an ax, an egg, wings, and ſuch like. The ſtyle of Greek authors, in the reign of Adrian, is unequal, obſcure, ſtiff, and affected. Lucian is the only exception. We need ſcarce any other cauſe but deſpotiſm, to account for the decline of ſtatuary and painting in Greece. Theſe arts had arrived at their utmoſt perfection, about the time of Alexander the Great; and from that time, they declined gradually with the vigour of a free people; for Greece was now enſlaved by the Macedonian power. It may in general be obſerved, that when a nation becomes ſtationary in that degree of power, which it acquires from its conſtitution and ſituation, the national ſpirit ſubſides, and men of talents become rare. It is ſtill worſe with a nation that is ſunk below its former power and pre-eminence; and worſt of all, when it is reduced to ſlavery. Other cauſes concurred to accelerate the downfal of the arts mentioned. Greece, in the days of Alexander, was filled with ſtatues of excellent workmanſhip; and there being little demand for more, the latter ſtatuaries were reduced to make heads and buſts. At laſt the Romans put a total end both to ſtatuary and painting in Greece, by plundering it of its fineſt pieces; and the Greeks, expoſed to the avarice of the conquerors, beſtowed no longer any money on the fine arts. The decline of the fine arts in Rome is, by Petronius Arbiter, a writer of taſte and elegance, aſcribed to a cauſe different from any above mentioned, a cauſe that overwhelms manhood, as well as the fine arts, wherever it prevails; and that is *opulence*, joined with its faithful attendants avarice and luxury. In England, the fine arts are far from ſuch perfection as to ſuffer by opulence. They are in a progreſs, indeed, towards maturity; but they proceed at a very ſlow pace. There is ſtill another cauſe that never fails to undermine a fine art in a country where it is brought to perfection, abſtracted from every one of the cauſes above mentioned. It is remarked a little above, that, nothing is more fatal to an art or ſcience, than a performance ſo much ſuperior to all of the kind, as to extinguiſh emulation. This cauſe would have been fatal to the arts of ſtatuary and painting among the Greeks, even though they had continued a free people. The decay of painting in modern Italy is, probably, owing to this cauſe: Michael Angelo. Raphael, Titian, &c. are lofty oaks, that bear down young plants in their neighbourhood, and intercept from them the ſunſhine of emulation. Had the art of painting made a ſlower progreſs in Italy, it might have there continued in vigour to this day. The decline of an art or ſcience proceding from the foregoing cauſe, is the moſt rapid where a ſtrict compariſon can be inſtituted between the works of different maſters, as between thoſe of Newton and other mathematicians. In Italy, a talent for painting continued many years in vigour, becauſe no painter appeared with ſuch ſuperiority of genius as to carry perfection in every branch of the art. As one ſurpaſſed in deſigning, one in colouring, one in graceful attitudes, there was ſtill ſcope for emulation. But, when at laſt, there was not a ſingle perfection, but what one or other maſter had excelled in, from that period the art began to languiſh. Architecture continued longer in vigour than painting, becauſe the principles of compariſon in the former are leſs preciſe than in the latter. The artiſt who could not rival his predeceſſors in an eſtabliſhed mode, ſought out a new mode for himſelf, which, though perhaps leſs elegant or perfect, was for a time ſupported by novelty. Uſeful arts will never be neglected in a country where there is any police; for every man finds his account in them. Fine arts are more precarious. They are not reliſhed but by perſons of taſte, who are rare; and ſuch as can ſpare great ſums for ſupporting them are ſtill more rare. For that reaſon, they will never flouriſh in any country, unleſs patroniſed by men of power and opulence. They merit ſuch patronage, as one of the ſprings of government; and a capital ſpring they make, by multiplying amuzements, and humanizing manners; upon which account, they have always been encouraged by wiſe magiſtrates.

The eſſence of the polite arts, as before obſerved, conſiſts in *expreſsion*. The end of all theſe arts is *pleaſure;* whereas the end of the ſciences is *instruction* and *utility*. Some of the polite arts indeed, as eloquence, poetry, and architecture, are frequently applied to objects that are uſeful, or exerciſed in matters that are inſtructive, as we ſhall ſhow more particularly in their proper place; but in theſe caſes, though the ground work belongs to thoſe ſciences which employ the underſtanding, yet the expreſſion ariſes from the inventive faculty. It ſhould therefore be conſtantly remembered, that the eſſence of the polite arts conſiſts in EXPRESSION. This expreſſion lies ſometimes in the words, and ſometimes in the pen; ſometimes in ſounds and their harmony, and at others, in corporeal attitudes; ſometimes in the pencil, or in the chiſel, and at others in the graver; ſometimes in a proper diſpoſition, or judicious employment of the mechanic arts, and at others, merely in their manner of acting.

The object of all the polite arts is BEAUTY. It is not, however, ſo eaſy, as it may ſeem, to give a clear and determinate idea of what we mean by that term. (See BEAUTY.) Many able writers, who have treated expreſsly on the ſubject, have ſhown that they were ignorant what it was. It is one of thoſe expreſſions that we comprehend immediately, that leave a diſtinct impreſſion on our minds, when it is ſimply written or pronounced; but which philoſophers envelope in darkneſs, when they attempt to elucidate it by definitions and deſcriptions; and the more, as mankind have different ideas of beauty, their opinions and taſtes being as various as their underſtandings and phyſiognomies. We may ſay, however, in general, that beauty reſults from the various perfections of which an object is ſuſceptible, and which it actually poſſeſſes; and that the perfections which produce beauty conſiſt principally in the agreeable and delightful proportions which are found.—1. Between the ſeveral parts of the ſame object; 2. Between each part and the whole together; 3. Between the parts and the end or deſign of the object to which they belong. GENIUS, or invention, is the faculty of the mind by which *beauty* is produced. TASTE, diſpoſition, or rather the natural ſenſation of the mind refined by art, ſerves to guide the genius in diſcerning, embracing, and producing, that which is beautiful of every kind. See TASTE. Hence it follows, that the general theory of the polite arts is nothing more than the knowledge of what they contain that is truly beautiful and agreeable; and it is this knowledge, this theory, which modern philoſophers call by the name of *æstbetica*, or ESTHETICS.

A reflection naturally ariſes on the polite arts in general. No rules whatever are capable of making a great poet, an able orator, or an excellent artiſt; becauſe the quality, neceſſary to form theſe, depends on the natural diſpoſition, the fire of genius, which no human art can confer, but which is the gift of heaven. Rules, however, will prevent a man from being a bad artiſt, a dull orator, or a wretched poet; ſeeing they are the reflections of the greateſt maſters in thoſe arts, and that they point out the rocks which the artiſt ſhould ſhun in the exerciſe of his talents. They are alſo of uſe in facilitating his labours, and in directing him to arrive by the ſhorteſt and ſureſt road to perfection. They refine, ſtrengthen, and confirm, his taſte. Nature abandoned to herſelf, has ſomething wild. Art, founded on juſt rules, gives her elegance, and dignity. Theſe general rules are of no great number. 1. The firſt is, that whoever would devote himſelf to the polite arts, ſhould above all things CONSULT HIS GENIUS. This precept has been often applied to poetry, but it is equally applicable to all the polite arts; in each of which, a man's moſt happy ſucceſs depends upon IMAGINATION. By this term we underſtand, in general, a faculty of the mind, a particular genius, a lively invention, a certain ſubtile ſpirit, which gives a facility in diſcovering new. But it is neceſſary alſo to preſcribe juſt bounds to this term *new*, which muſt not be here taken in an abſolute ſenſe. Solomon remarks, that, even in his time, "there was nothing NEW under the ſun." The fine arts in their imitations of nature, in their expreſſions, can borrow images, figures, compariſons, from thoſe things only that exiſt and are known. But the novelty, of which we here ſpeak, conſiſts in the ingenious uſe of combinations of all the various objects of nature, that are new, happy, and agreeable, that have not yet been exhauſted, and which appear even to be inexhauſtible; and of the uſe which the artiſt makes of all new diſcoveries, which he turns to his advantage, by a judicious application. Invention therefore ſuppoſes a conſiderable fund of preliminary knowledge, ſuch as is capable of furniſhing ideas and images, to form new combinations. But there is no art by which invention itſelf can be produced ; for that gift of heaven is an endowment, which even thoſe poſſeſſed of it cannot always uſe at pleaſure. We would rather ſay, therefore, that invention conſiſts in producing, in works of genius, *that which is unexpected ;* an object, a harmony, a perfection, a thought, an expreſſion, of which we had no idea, that we could not foreſee, nor hope to find, where the artiſt has ſo happily placed it, and where we perceive it with delight. This idea appears applicable to ſuch of the polite arts as affect the mind by the hearing as well as by the ſight ; and it is a matter that is highly eſſential.—2. The ſecond rule is, that every artiſt ought inceſſantly to labour in the improvement of his *taste ;* in acquiring that refined, and clear diſcernment, by which he will be enabled to diſtinguiſh the real beauties in each object, the ornaments that are agreeable to it, and the proportions that ſubſiſt among the ſeveral parts : and by this faculty, he will be regulated in the employment of his natural talents. This labour conſiſts not only in the profound reflections he will make on the properties of objects as they relate to the fine arts, but alſo in a conſtant, aſſiduous ſtudy of the grand models of beauty. 3. The third rule to be obſerved in the practice of the polite arts, *is the imitation of natnre.* Every object in the univerſe has its peculiar nature, of which the artiſt ſhould never loſe ſight in his manner of treating it. In vain will he otherwiſe ornament his work with the moſt refined and moſt brilliant ſtrokes ; for, if nature be not juſtly imitated, the work will forever remain imperfect. Homer himſelf has ſometimes ſinned againſt this rule. Not to mention the ridiculous and unnatural paſſions attributed to his deities, (wherein the general belief of the Grecian mythology might perhaps juſtify him,) it was ſurely not imitating nature, to put into the mouth of a hero, at the moment of a deciſive battle, a harrangue tedious by its exceſſive length, and which certainly could not have been heard by the thouſandth part of a numerous army. Indeed the imitation of nature, which appears at firſt view ſo ſimple and ſo eaſy, is of all things the moſt difficult in practice ; and it requires a diſcernment ſo ſagacious, and an expreſſion ſo happy, as is rarely beſtowed on mortal man. 4. Perspicuity forms the fourth rule of expreſſion. In all the fine arts, an obſcure, perplexed, ambiguous, and elaborate expreſſion, is always bad. The true ſtriking beauty muſt be manifeſt and perceptible to the moſt ignorant of mankind as well as the moſt learned. Thoſe are ever falſe or inferior beauties that have occaſion for a covering, a kind of veil that may make them appear greater than they really are : true beauty wants no veil, but ſhines by its native luſtre. From the union of the true imitation of nature with perſpicuity of expreſſion ariſes that *truth* which is ſo eſſential in the productions of the fine arts. 5. In all the polite arts, and in all the ſubjects they embrace, there muſt neceſſarily reign an elevation of ſentiment, that expreſſes each object in the greateſt perfection of which it is ſuſceptible ; that imitates nature in her moſt exalted beauty. This makes the fifth general rule. The deſign of the fine arts being to excite pleaſure by the expreſſion of that which is beautiful, every artiſt ſhould raiſe himſelf above his ſubject ; and, chooſing the moſt favourable light wherein to place it, ſhould there embelliſh it with the greateſt, moſt noble, and beautiful ornaments, that his own genius can ſuggeſt ; ſtill, however, obſerving a ſtrict imitation of nature. 6. From the obſervation of theſe two laſt rules reſults the sublime, which is the union of the greateſt perſpicuity with the ſtricteſt truth and moſt exalted elevation poſſible. It is neceſſary to remark here, that the moſt ſimple and common ſubjects are ſuſceptible of a ſublime that is agreeable to nature. An idol or landſcape may be as ſublime in their kinds as an epic poem or a hiſtory piece. When Moſes begins the book of Geneſis with theſe words, "In the beginning God created the heaven and the earth ;" or when he tells us, that God ſaid "Let there be light, and there was light ; theſe expreſſions are ſublime in the higheſt degree, becauſe they are perfectly clear, true, and elevated. Every author ſhould therefore endeavour after the *ſublime* in every ſubject that he undertakes ; and this makes the ſixth and laſt general rule in the practice of the polite arts. See Grandeur and Sublimity. But if he cannot attain to this, it is indiſpenſably neceſſary that he conſtantly make uſe of expreſſions that are *noble and refined.* Every thing that is *low*, *indecent*, or *diſagreeable*, is naturally repugnant to the ſublime, and ought to be baniſhed from all that would proceed from the liberal arts.

Art, the ſecond perſon ſingular of the verb to be.

ARTERIAL, *adj.* that which relates to the artery ; that which is contained in the artery.

ARTERIES. See Anatomy.

ARTERIOSA vena, or arterial vein, a denomination given to the pulmonary artery.

ARTERIOSUS canalis, a tube in the heart of the *fœtus*, which, with the *foramen ovale*, ſerves to maintain the circulation of the blood, and to divert it from the lungs.

ARTERY, *n. s.* in Anatomy, a hollow fiſtulous canal, appointed to receive the blood from the ventricles of the heart and diſtribute it to all parts of the body, for the maintenance of heat and life, and the conveyance of neceſſary nouriſhment. For a copious deſcription of anatomy, ſee the ſyſtem.

ARTFUL, *adj.* 1. Performed with art.—2. Artificial ; not natural.—3. Cunning ; ſkilful ; dexterous.

ARTFULLY, *adv.* with art ; ſkilfully ; dexterouſly.

ARFULNESS, *n. s.* 1. Skill.—2. Cunning.

ARTHRITICAL, } *adj.* 1. Gouty ; relating to the
ARTHRITICK, } gout.—2. Relating to joints.

ARTHRITIS, *n. s.* a joint. Any diſtemper that affects the joints, but the gout particularly. See Medicine.

Arthritis planetica, } the wandering gout, that
Arthritis vaga, } gives pain ſometimes in one
limb, and ſometimes in another.

ARTICHOKE, *n. s.* this plant is very like the thiſtle, but hath large ſcaly heads ſhaped like the cone of the pine tree ; the bottom of each ſcale, as alſo at the bottom of the florets, is a thick fleſhy eatable ſubſtance. See Cinara.

Artichoke of Jerusalem, a ſpecies of ſun flower.

ARTIC, *adj.* northern; under the bear. See **Arctic.**

ARTICLE, *n. s.* 1. A part of ſpeech, as, *the*, *an*; *the* man; *an* ox.—2. A ſingle clauſe of an account; a particular part of any complex thing.—3. Terms; ſtipulations.—4. Point of time; exact time.

Article, articulus, in anatomy, a joint, or juncture, of two or more bones of the body.

Article, in arithmetic, ſignifies the number 10, or any number juſtly diviſible into ten parts, as 20, 30, 40, &c.

Article, in grammar, denotes a particle uſed in moſt languages for the declining of nouns, and denoting the ſeveral caſes and genders thereof. The uſe of articles ariſes chiefly hence, that in languages, which have no different terminations, to expreſs the different ſtates and circumſtances of nouns, there is ſomething required to ſupply that office. The Latins have no articles; but the Greeks, and moſt of the modern languages, have had recourſe to them, for fixing and aſcertaining the vague ſignification of common and appellative names. The Greeks have their *ho*; the eaſtern tongues their *he emphaticum*; the Italians their *il*, *lo*, and *la*. The French their *le*, *la*, and *les*. The Germans their *der*, *das*, *dat*. The Engliſh alſo have three articles, *a*, *an*, and *the*; which, being prefixed to ſubſtantives, apply their general ſignification to ſome particular things. Some grammarians make the article a diſtinct part of ſpeech; others will have it a pronoun, and others a noun adjective. See **Grammar.**

Article, in literary compoſition, a ſmall part or diviſion of a book, or writing, &c.

Article of faith, is by ſome defined a point of Chriſtian doctrine, which we are obliged to believe, as having been revealed by God himſelf, and allowed and eſtabliſhed as ſuch by the church. The thirty-nine articles of the church of England were founded, for the moſt part, upon a body of articles compiled and publiſhed in the reign of Edward VI. They were firſt paſſed in the convocation, and confirmed by royal authority in 1562. They were afterwards ratified anew in the year 1571, and again by Charles I.

To **Article**, *v. a.* to draw up in particular articles.

To **Article**, *v. n.* to ſtipulate; to make terms.

ARTICULAR, *adj.* belonging to the joints.—In medicine, an epithet applied to a diſeaſe, which more immediately infeſts the joints.

ARTICULARIS morbus. See laſt article.

ARTICULATE, *adj.* 1. Diſtinct.—2. Branched out into articles.

Articulate sounds, are ſuch as expreſs the letters, ſyllables, or words, of an alphabet or language: ſuch as are formed by the human voice, and by ſome few birds, as parrots, &c.

To **Articulate**, *v. a.* 1. To form words; to utter diſtinct ſyllables; to ſpeak as a man.—2. To draw up in articles.—3. To make terms; to treat.

To **Articulate**, *v. n.* to ſpeak diſtinctly.

ARTICULATELY, *adv.* in an articulate voice.

ARTICULATENESS, *n. s.* the quality of being articulate.

ARTICULATION, *n. s.* 1. The juncture, or joint of bones.—2. The act of forming words.

Articulation, in anatomy. See **Anatomy.**

Articulation, in botany, is the connection of parts that conſiſt of joints or knees, ſuch as the pods of French honey-ſuckles, which when ripe, divide into ſo many parts as there are knees or joints; alſo thoſe parts of plants which ſwell into nodes or joints, and which uſually ſend forth branches.

Articulation, in grammar, a diſtinct pronunciation of words and ſyllables.

ARTIFICE, *n. s.* 1. Trick; fraud; ſtratagem.—2. Art; trade; ſkill obtained by ſcience or practice.

ARTIFICER, *n. s.* 1. An artiſt; a manufacturer; one by whom any thing is made.—2. A forger; a contriver. Artificers amount to the ſame with what we otherwiſe call *handicrafts* and *mechanics*; ſuch as ſmiths, carpenters, taylors, ſhoemakers, weavers, and the like. In almoſt all ages, till the preſent, and under moſt forms of government, artificers have been too little reſpected. By means of the arts, the minds of men are engaged in inventions beneficial to the whole community; and thus prove the grand preſervative againſt the barbariſm and brutality, which ever attend indolence and induce ſtupidity. Ramazini has a treatiſe on the diſeaſes of artificers. By the Engliſh laws, artificers in wool, iron, ſteel, braſs, or other metal, going out of the kingdom into any foreign country without licence, are to be impriſoned three months, and fined in a ſum not exceeding $444. And ſuch as go abroad, and do not return on warning given by their ambaſſadors, &c. ſhall be diſabled from holding lands by deſcent or deviſe, from receiving any legacy, &c. and be deemed aliens. Penalty is alſo inflicted on ſeducing artificers to go abroad.

ARTIFICIAL, *adj.* 1. Made by art; not natural.—2. Fiction; not genuine.—3. Artful; contrived with ſkill.

ARTIFICIALLY, *adv.* 1. Artfully; with ſkill.—2. By art; not naturally.

ARTILLERY, *n. s.* In its general ſenſe, denotes, 1. the offenſive apparatus of war, particularly of the miſſile kind. Among the French the term was anciently appropriated to **Archery.** In its modern ſignification it ſignifies fire-arms, mounted on their carriages and ready for action, with their balls, bombs, grenades, &c.—2. In a more extenſive meaning, it includes the powder, the matches, inſtruments for fire-works, the utenſils of ordnance, the means which facilitate their motion and tranſport them, the vehicles over which they traverſe rivers, every thing neceſſary to them, and all that enters into the form of a train of artillery.—3. In a ſenſe ſtill more extenſive, the word likewiſe comprehends the men deſtined for the ſervice of the *artillery*; the people who provide the artillery with materials and implements when engaged, the cannoniers, the bombardiers, the officers of every rank, and engineers of every kind.—4. By the term *artillery* is likewiſe underſtood the ſcience which the officers of artillery ought to poſſeſs. This ſcience teaches to know the nature of all the materials and ingredients which enter into the compoſition and the ſtructure of every thing relative to the artillery, ſuch as nitre, ſulphur, charcoal; the properties of air and fire; the compoſition and preparation of gun-powder; the materials for fire-works; conſtruction, proportions, &c. for the different warlike machines; the arrangment, movement, and whole management, of cannon, &c. in the field or in sieges, in ſuch a manner, that each of them, according to the length of its tube and the diameter of its bore, may be ſituated in the beſt place and at the propereſt diſtance for execution, and that the whole train taken together may reciprocally aſſiſt and ſupport each other with the greateſt advantage.

Artillery has undergone many changes from its origin to the preſent time. The artillery of the ancients were the catapulta, the baliſtæ, the different kinds of ſlings, &c. In latter ages, the Franks uſed the hatchet as a miſſile weapon, throwing it in the ſame manner as the Americans do the *tomahawk*. The Gaſcons and Genoeſe were excellent croſs-bow men. The Swiſs owed their victories to their ſtrength and ſkill in the uſe of the pike, halberd, and eſpadon or two handed ſword; and the victories of Creſſy, Poictiers, and Agincourt, will occaſion the valour and ſkill of the Engliſh archers to be tranſmitted down to the lateſt poſterity. Cannon is one of the moſt ſingular diſcoveries which have been made amongſt men; and by little and little, it has changed the whole art of war, and of conſequence, the whole ſyſtem of policy, in Europe. The æra of artillery is dated from the battle of Creſſy in 1346, becauſe it is only from that day that cannons were mentioned in battle. Edward III. of England ſucceſsfully employed ſome pieces of artillery, placed in the front of his army. The invention of artillery was then known in France, as well as in England; but probably Philip VI. marched with ſo much hurry and precipitation to attack his enemy, that he left his cannon as uſeleſs incumbrances behind him. The ignorance of that age in mechanical arts, conſiderably retarded the progreſs of artillery; and that of which they were then poſſeſſed, was ſo unwieldy and imperfect, that they could not poſſibly diſcern its importance and efficacy in practice.

After the invention of gun-powder, the Spaniards were the firſt who armed part of their foot with muſkets and arquebuſſes, and mixed them with the pikes. In this they were ſoon imitated by moſt other nations; though the Engliſh had not entirely laid aſide their favourite weapon the long bow, and generally taken to the uſe of fire arms, during the reign of queen Elizabeth. The firſt muſkets were very heavy, and could not be fired without a reſt: they had matchlocks, and barrels of a wide bore, that carried a large ball and charge of powder, and did execution at a great diſtance. The muſketeers on a march carried only their reſts and ammunition, and had boys to bear their muſkets after them, for which they were allowed great additional pay. They were very ſlow in loading, not only by reaſon of the unwieldineſs of the pieces, and becauſe they carried the powder and balls ſeparate, but from the time it took to prepare and adjuſt the match; ſo that their fire was not near ſo briſk as ours is now. Afterwards a lighter kind of matchlock muſket came into uſe; and they carried their ammunition in bandeliers, which were broad belts that came over the ſhoulder, to which were hung ſeveral little caſes of wood, covered with leather, each containing a charge of powder; the balls they carried looſe in a pouch, and they had alſo a priming horn hanging by their ſides. Matchlocks were, about the beginning of the laſt century, univerſally diſuſed in Europe, and the troops were armed with firelocks; to which, much about the ſame time, the bayonet being added, pikes alſo were laid aſide. The old Engliſh writers call thoſe large muſkets *calivers;* the arquebuſs was a lighter piece, that could be fired without a reſt. The matchlock was fired by a match, fixed by a kind of tongs in the ſerpentine or cock, which, by pulling the trigger, was brought down with great quickneſs upon the priming of the pan, over which there was a ſliding cover, which was drawn back by the hand, juſt at the time of firing. There was a great deal of nicety and care required to fit the match properly to the cock, ſo as to come down exactly true on the priming, to blow the aſhes from the coal, and to guard the pan from the ſparks that fell from it: a great deal of time was loſt in taking it out of the cock, and returning it between the fingers of the left hand, every time that the piece was fired; and wet weather often rendered the matches uſeleſs. However, moſt writers allow that they were very ſure, and leſs apt to miſs fire, than the firelock. The firelock is ſo called, from producing fire of itſelf, by the action of the flint and ſteel. The moſt ancient invention of this ſort is the wheel lock, which we find mentioned in Luigi Collado's Treatiſe of Artillery, printed at Venice, 1586, as then lately invented in Germany. This ſort of lock was uſed till within theſe hundred years, eſpecially for piſtols and carbines. It is compoſed of a ſolid ſteel wheel, with an axis, to which was faſtened a chain, which, by being round it, drew up a very ſtrong ſpring; on pulling the trigger, the ſpring acting, whirled the wheel about with great velocity, and the friction of the edge of it (which was a little notched) againſt the ſtone, produced the fire: the cock was made ſo as to bring the ſtone upon the edge of the wheel, part of which was in the pan, and touched the priming; they uſed any common hard pebble for that purpoſe, which ſerved as well as flint. Theſe locks were inconvenient, took time to wind up (or ſpan, as they termed it), and ſometimes would not go off; an inſtance of which may be ſeen in Ludlow's Memoirs. When the firelock, ſuch as we now uſe, was invented, we cannot aſcertain: it is called, by writers of about the middle of the laſt century, a *ſnaphane*, or *ſnaphance;* which being the Dutch word for a *firelock*, ſeems to indicate, that it is a Dutch invention, and that we took it from them. But Ward, in his Animadverſions of War, (printed in 1639, p. 502,) after deſcribing the exerciſe of the firelock, piſtol, and carbine, (by which he means the wheel lock), ſays that as moſt of our pieces go with Engliſh locks, which differ from firelocks, he ſhall add the method of handling them; and then gives the exerciſe of the ſnaphine carbine; by which it appears, that there was little or no difference between that and the pieces now in uſe. The modern writers call it a *fuſee*, from the French word *fuſil;* whence the name of fuſileers is ſtill continued to ſeveral Britiſh regiments, which were the firſt which were armed with them on the diſuſe of matchlocks. They uſed the muſkets and reſt in England, ſo late as the beginning of the civil wars, as may be ſeen in Col. Bariffe's Young Artillery Man, printed at London, 1643. Figuerra, in his embaſſy in 1518, relates, that the Perſians would neither make uſe of infantry nor of artillery, becauſe by them the impetuoſity of attack, and the facility of retreat were equally incumbered and retarded: in theſe expedients alone, their addreſs and their glory conſiſted.—This method of advancing and recalling is widely different from the preſent conduct of war, as the artillery in armies is now prodigiouſly multiplied, and muſt be tranſported to every place where any body of troops whatever is deſtined to operate. The length and diameter of cannon has been much diminiſhed, which muſt likewiſe proportionably diminiſh their weight. It is by long practice and experience, that they have diſcovered how much might be deducted from their magnitude in both reſpects with propriety, without hurting the grand effects which, on ſome occaſions, it is neceſſary they ſhould produce, by rendering them more eaſy to be wielded, which was the advantage propoſed by leſſening their ſize. See CANNON, GUNNERY, and PROJECTILES. Improvements, however, are ſtill making, and will probably long continue to be made, in theſe ignivomous machines, that mock the thunder, which, though they ſeem to be invented for the deſtruction of the human race, and the ſubverſion of empires, have yet by their effects rendered war leſs ſavage and ſanguine; political alliances have been more ſucceſsfully conciliated among all nations, conqueſts are become leſs frequent, and leſs rapid, and ſucceſſes in war have been more eaſily reduced to calculation. In modern war, the great expence of fire arms gives an evident advantage to the nation which can beſt afford that expence; and conſequently, to an opulent and civilized, over a poor and barbarous nation. In ancient times, the opulent and civilized found it difficult to defend themſelves againſt the poor and barbarous nations. In modern times, the poor and barbarous find it difficult to defend themſelves againſt the opulent and civilized. The invention of fire arms, an invention, which at firſt ſight appears to be ſo pernicious, is certainly favourable to the permanency and to the extenſion of civilization. In the battles of the Greeks and Romans, the extraordinary diſproportion between the numbers ſlain on the ſide of the victors and the vanquiſhed, has been obſerved as a remarkable circumſtance. But this neceſſarily reſulted from the nature of their arms. Their principal weapons not being miſſile, but manual, armies could not begin to act, till they had approached ſo nearly to each other, that the conquered found themſelves cut off from all poſſibility of retreat. In modern times, ſuch conſequences ſeldom take place. The uſe of fire arms (which often renders the action itſelf more bloody,) furniſhes the defeated party with various means of retreating, with conſiderable ſafety. The ſphere of military action is ſo widely extended in modern times, that before the victors can run over the ſpace which ſeparates them from the vanquiſhed, the latter may fall back, and proceed with little loſs beyond their reach; and ſhould any village, hedge, ravine, &c. be found in their way, may often check the ardour of the purſuers. Upon theſe conſiderations, the invention of gun-powder and modern artillery may be ſaid to have ſaved the effuſion of human blood. Equeſtrian engagements (the principles on which cavalry act, being nearly the ſame in every age) are ſtill ſimilar in circumſtances to thoſe which appear ſo extraordinary in the battles of antiquity.

ARTIST, *n. s.* 1. The profeſſor of an art, generally of an art manual.

ARTLESLY, *adv.* 1. In an artleſs manner; without ſkill.—2. Naturally; ſincerely; without craft.

ARTLESS, *adj.* 1. Unſkilful; wanting art.—2. Without fraud.—3. Contrived without ſkill; as an *artleſs* tale.

ARTOCARPUS, the BREAD-FRUIT TREE: a genus of the monandria order, belonging to the monœcia claſs of plants. It has a cylindric amentum or catkin, which thickens gradually, and is covered with flowers; the male and female in a different amentum. In the male, the calyx is two valved, and the corolla is wanting. In the female, there is no calyx nor corolla; the ſtylus is one, and the drupa is many celled.

Though this tree has been mentioned by many voyagers, particularly by Dampier, by Rumphius, and by Lord Anſon, yet very little notice ſeems to have been taken of it, till the return of captain Wallis from the South Sea, and ſince that time by others, who have touched at Otaheite, and ſome countries in the Eaſt Indies. Captain Dampier relates, that in Guam, one of the Ladrone iſlands, "there is a certain fruit called the *bread-fruit*, growing on a tree as big as our large apple trees, with dark leaves. The fruit is round, and grows on the boughs like apples, although much bigger: when ripe, it turns yellow, ſoft and ſweet; but the natives take it green, and bake it in an oven till the rind is black; this they ſcrape off, and eat the inſide, which is ſoft and white, like the inſide of new baked bread, having neither ſeed nor ſtone; but if it be kept above 24 hours it is harſh. As this fruit is in ſeaſon eight months in the year, the natives feed upon no other ſort of bread during that time. They told us that all the Ladrone iſlands had plenty of it. I never heard of it in any other place." RUMPHIUS, after deſcribing the tree, obſerves, that the fruit is ſhaped like a heart, and increaſes to the ſize of a child's head. Its ſurface or rind is thick, green, and covered every where with warts of a quadragonal or hexagonal figure, like cut diamonds, but without points. The more flat and ſmooth theſe warts are, the fewer ſeeds are contained in the fruit, and the greater is the quantity of pith, and that of a more glutinous nature. The internal part of the rind, or peel, conſiſts of a fleſhy ſubſtance, full of twiſted fibres, which have the appearance of fine wool; theſe adhere to, and in ſome meaſure form it.—The fleſhy part of this fruit becomes ſofter towards the middle, where there is a cavity formed without any nuts or ſeeds, except in one ſpecies, which has but a ſmall number, and this ſort is not good unleſs it is baked, or prepared ſome other way: but if the outward rind be taken off, and the fibrous fleſh dried and afterwards boiled with meat as we do cabbage, it has then the taſte of artichoke bottoms. The inhabitants of Amboyna dreſs it in the liquor of cocoa-nuts: but they prefer it roaſted on coals till the outward part or peel is burnt. They afterwards cut it into pieces, and eat it with the milk of the cocoa-nut. Some people make fritters of it, or fry it in oil; and others, as the Sumatrians, dry the internal ſoft part, and keep it to uſe inſtead of bread with other food. It affords a great deal of nouriſhment, and is very ſatisfying, therefore proper for hard working people; and being of a gentle aſtringent quality, is good for perſons of a laxative habit of body. It is more nouriſhing boiled in our manner with fat meat than roaſted on coals. This tree is to be found on the eaſtern parts of Sumatra, and likewiſe about the town of Bantam in Java, and in Balega and Madura, where it is known by the name of *ſoccum*." Captain COOK, in his voyage, obſerves, that this fruit not only ſerves as a ſubſtitute for bread among the inhabitants of Otaheite and the neighbouring iſlands, but alſo, variouſly dreſſed, compoſes the principal part of their food. It grows on a tree that is about the ſize of a middling oak; its leaves are frequently a foot and an half long, of an oblong ſhape, deeply ſituated like thoſe of the fig-tree, which they reſemble in colour and conſiſtence, and in the exſuding of a milky juice upon being broken. The fruit is about the ſize and ſhape of a new-born child's head; and the ſurface is reticulated, (ſee Plate XIV.) not much unlike a truffle; it is covered with a thin ſkin, and has a core about it as big as the handle of a ſmall knife. The eatable part lies between the ſkin and the core; it is as white as ſnow, and ſomewhat of the conſiſtence of new bread; it muſt be roaſted before it is eaten, being firſt divided into three or four parts; its taſte is inſipid, with a ſlight ſweetneſs ſomewhat reſembling that of the crumb of wheaten bread mixed with a Jeruſalem artichoke. This fruit is alſo cooked in a kind of oven, which renders it ſoft, and ſomething like a boiled potato; not quite ſo farinaceous as a good one, but more ſo than thoſe of the middling ſort. Of the bread-fruit they alſo make three diſhes, by putting either water or the milk of the cocoa nut to it, then beating it to a paſte with a ſtone peſtle, and afterwards mixing it with ripe plantains, bananas, or the ſour paſte which they call *mahie.*

The MAHIE, which is likewiſe made to ſerve as a ſuccedaneum for ripe bread-fruit before the ſeaſon is come on, is thus made: The fruit of the bread-tree is gathered juſt before it is perfectly ripe; and being laid in heaps, is cloſely covered with leaves: in this ſtate it undergoes a fermentation, and becomes diſagreeably ſweet; the core is then taken out entire, which is done by gently pulling out the ſtalk, and the reſt of the fruit is thrown into a hole which is dug for that purpoſe generally in the houſes, and neatly lined in the bottom and ſides with graſs: the whole is then covered with leaves and heavy ſtones laid upon them; in this ſtate it undergoes a ſecond fermentation, and becomes ſour, after which it will ſuffer no change for many months. It is taken out of the hole as it is wanted for uſe; and being made into balls, it is wrapped up in leaves and baked: after it is dreſſed, it will keep for five or ſix weeks. It is eaten both cold and hot; and the natives ſeldom make a meal without it, though to Europeans the taſte is as diſagreeable as that of a pickled olive generally is the firſt time it is eaten. The fruit itſelf is in ſeaſon eight months in the year, and the mahie ſupplies the inhabitants during the other four.

To procure this principal article of their food, coſts theſe happy people no trouble or labour, except climbing up a tree: the tree which produces it does not indeed grow ſpontaneouſly; but if a man plants ten of them in his lifetime, which he may do in an hour, he will as completely fulfil his duty to his own and future generations, as the native of our leſs temperate climate can do, by ploughing in the cold winter, and reaping in the ſummer's heat, as often as theſe ſeaſons return; even if, as often as he has procured bread for his preſent houſehold, he ſhould convert a ſurplus into money, and lay it up for his children. There are two ſpecies of this tree, viz. The INCIUS, with gaſhed leaves; and the INTEGRIFOLIA, with entire leaves.

There is ſaid to be another diſtinction, into that which bears fruit with ſtones or ſeeds, and that in which the fruit has none. The parts of fructification of that tree which bears the fruit without ſtones are defective. The amentum or catkin, which contains the male parts, never expands. The ſtyli, or female parts of the fruit, are likewiſe deficient: From which it follows, that there can be no ſtones or ſeeds, and therefore this tree can only be propagated by ſuckers or layers; although it is abundantly evident, that it muſt originally have proceeded from the ſeed-bearing bread-fruit tree. Inſtances of this kind we ſometimes find in European fruits; ſuch as the barberry, and the Corinth grape from Zant, commonly called currants, which can therefore be increaſed only by layers and cuttings. Dr. Solander was aſſured by the oldeſt inhabitants of Otaheite and the adjoining iſlands, that they well remembered, there was formerly plenty of the ſeed bearing bread-fruit; but they had been neglected upon account of the preference given to the bread-fruit without ſeed, which they propagate by ſuckers. Three hundred and forty-ſeven plants of the Artocarpus or bread tree, were brought from Otaheite to Jamaica, in the year 1793, where they are ſaid to thrive well.

ARTOIS, a ci-devant province of France, extremely fertile, and formerly one of the 17 provinces of the Netherlands. Its greateſt length from N. to S. was about 24 leagues, and its breadth about 12, being bounded to the S. and W. by Picardy, to the E. by Hainault, and to the N. by Flanders. It is now included in the department of the Straits of Calais.

ARUNDO, in botany, the REED: A genus of the digynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 4th order Gramina. The calyx conſiſts of two valves, and the floſcules are thick and downy. There are ſix ſpecies, viz.

1. The ARBOREA, which has a tree-like ſtalk, with narrow leaves, and in all other reſpects reſembles the Bambos.

2. The BAMBOS, or the bamboos, which is a native of the Eaſt Indies and ſome parts of America; where it frequently attains the height of 60 feet.

3. The DEBAX, or manured reed, which is a native of warm countries, and if plentifully ſupplied with water, grows 10 or 12 feet high in one ſummer. The ſtalks of this are uſed by the weavers, as alſo for making fiſhing rods.

4. The ORIENTALIS, is what the Turks uſe as writing pens; it grows in a valley near mount Athos, as alſo on the banks of the river Jordan.

5. The PHRAGMITIS, or the common marſh-reed, which grows by the ſides of rivers, and in ſtanding waters.

6. The VERSICOLOR, or Indian variegated reed, which is ſuppoſed to be a variety of the Debax, differing from it only in having variegated leaves.

ARUNDO INDICA in the materica medica, the name of the *arundo ſanguinem draconis manans* of Moriſon. This is the plant from the fruit of which, by maceration in warm water, they get a kind of dragon's blood, which makes the fine red of the Indian varniſhes.

ARUNDO SACCHARIFERA, the *Sugar cane.* See SACCHARUM.

ARUSPICE, *n. ſ.* divination by examining the intrails of animals.

ARUSPICES, or HARUSPICES, in Roman antiquity, an order of prieſts who pretended to foretel future events by inſpecting the intrails of victims killed in ſacrifice; they were alſo conſulted on occaſion of portents and prodigies. The haruſpices were always choſen from the beſt families;

and as their employment was of the ſame nature as that of the augurs, they were as much honoured.

AS, among the ancient Romans, a particular weight, conſiſting of 12 ounces; being the ſame with *libra*, or the Roman pound.—*As* was alſo the name of a Roman coin, which was of different weights and different matter in different ages of the commonwealth. Its original ſtamp was that of a ſheep, ox, or ſow: but from the time of the emperors, it had on one ſide a Janus with two faces, and on the reverſe the roſtrum or prow of a ſhip.—*As* was alſo uſed to denote any integer or whole. Whence the Engliſh word *ace*. Thus *as* ſignified the whole inheritance; whence *hæres ex asse*, the heir to the whole eſtate.

As, *conjunct.* 1. In the ſame manner with ſomething elſe.—2. In the manner that.—3. That; in a conſequential ſenſe.—4. In the ſtate of another.—5. Under a particular conſideration.—6. Like; of the ſame kind with.—7. In the ſame degree with.—8. As with; in the ſame manner.—9. According to what.—10. As it were; in ſome ſort.—11. While; at the ſame time that.—12. Becauſe.—13. Becauſe it is.—14. Equally.—15. How; in what manner.—16. With; anſwering to *like* or *same*.—17. In a reciprocal ſenſe, anſwering to *as*.—18. Going before *as*, in a comparative ſenſe; the firſt *as* being ſometimes underſtood.—19. Anſwering to *such*.—20. Having *so* to anſwer it; in a conditional ſenſe.—21. Anſwering to *so* conditionally.—22. In a ſenſe of compariſon, followed by *so*.—23. As FOR; with reſpect to.—24. As IF; in the ſame manner that it would be if.—25. As THOUGH; as if.—26. As TO; with reſpect to.—27. As WELL AS; equally with.

ASA FOETIDA. ASSA FOETIDA, *n. s.* a gum or reſin brought from the Eaſt Indies, of a ſharp taſte, and a ſtrong offenſive ſmell; which is ſaid to diſtil during the heat of ſummer, from a little ſhrub. See FERULA.

ASAR, a gold coin, current at Ormus, in the Perſian gulph, worth about 1 dollar and 46 cents.

ASBESTINE, *adj.* incombuſtible, or that partakes of the nature and qualities of the *lapis asbestos*.

ASBESTOS, *n. s.* a ſort of native foſſile ſtone, which may be ſplit into threads and filaments, from one inch to ten inches in length, very fine, brittle, and ſomewhat tractable, ſilky, and of a greyiſh colour. It is almoſt inſipid to the taſte, indiſſoluble in water, and endued with the wonderful property of remaining unconſumed in the fire. This ſtone is found in Angleſey in Wales, and in Aberdeenſhire in Scotland; as alſo in Crete and Cyprus; in Tartary; at Namur in the Low Countries; in Thuringia among the mines; in the Old Noricum, in Egypt; in the mountains of Arcadia; at Puteoli; in the iſland of Corſica; at Montauban in France; and in Siberia.

The induſtry of mankind has found a method of working this untoward mineral, and employing it in divers manufactures, chiefly cloth and paper. The manufacture is undoubtedly difficult enough. Pliny calls the aſbeſtos *inventu rarum, textu difficillimum.* Wormius aſſures us, that the method of making cloth of aſbeſtos is now entirely unknown. And indeed one would ſcarce imagine the thing practicable, without the mixture of ſome other pliant matter, as wool, hemp, or flax, along with the aſbeſtos, the filaments of this latter appearing too coarſe and brittle to make any tolerable fine work. However this be, Bapt. Porta aſſures us, that in his time the ſpinning of aſbeſtos was a thing known to every body at Venice. Sig. Caſtagnatta, ſuperintendant of ſome mines in Italy, is ſaid to have carried the manufacture to ſuch perfection, that his aſbeſtos was ſoft and tractable, much reſembling lamb-ſkin dreſſed white: he could thicken and thin it at pleaſure, and thus either make it into a very white ſkin or a very white paper. The method of preparing the incombuſtible paper and cloth is thus deſcribed by Ciampini: The ſtone is laid to ſoak in warm water; then opened and divided by the hands, that the earthy matter may be waſhed out. The ablution being ſeveral times repeated, the flax-like filaments are collected and dried; and they are moſt conveniently ſpun with an addition of flax. Two or three filaments of the aſbeſtos are eaſily twiſted along with the flaxen thread, if the operator's fingers are kept oiled. The cloth alſo, when woven, is beſt preſerved by oil from breaking or waſting. On expoſure to the fire, the flax and the oil burn out, and the cloth remains pure and white. The ſhorter filaments which ſeparate in waſhing the ſtone, may be made into paper in the common manner.

The aſbeſtos cloth was chiefly eſteemed by the ancients; though then better known and more common than among us, being held equally precious with the richeſt pearls: nor is it now of mean value, even in the country where it is moſt generally made, a China cover, (i. e. a piece of 23 inches and three quarters long) being worth 80 tales, i. e. 163 dollars and 56 cents. Pliny ſays, he himſelf had ſeen napkins thereof, which, being taken foul from the table after a feaſt, were thrown into the fire, and by that means were better ſcoured than if they had been waſhed in water.

ASCARIS, in zoology, a genus of inſects belonging to the order of vermes inteſtina. The body of the aſcaris is cylindrical, filiform, and tapers at both ends. See Plate XIII. fig. 16.—There are two ſpecies, viz.

1. The LUMBRICOIDES, which is about the ſame length with the lumbricus terreſtris, or common earth worm; but wants the protuberent ring towards the middle of the body, the only mark by which they can properly be diſtinguiſhed. The body of the lumbricoides is cylindrical, and ſubulated at each extremity; but the tail is ſomewhat triangular. The lumbricoides is the worm which is moſt commonly found in the human inteſtines. It is viviparous, and produces vaſt numbers.

2. The VERMICULARIS, with faint annular rugæ, and the mouth tranſverſe, is about a quarter of an inch long, and thicker at one end than the other. It is found in boggy places, in the roots of putrid plants, and very frequently in the rectum of children and horſes. It emaciates children greatly, and is ſometimes vomited up. For the method of expelling theſe two kinds of inſects, ſee MEDICINE.

To ASCEND, *v. a.* to climb up any thing.

To ASCEND, *v. n.* 1. To move upwards; to mount; to riſe.—2. To proceed from one degree of good to another.—3. To ſtand higher in geneaology.

ASCENDABLE, *adj.* that may be aſcended.

ASCENDANT, *adj.* 1. Superior; predominant; overpowering.—2. In an aſtrological ſenſe, above the horizon.

ASCENDANT, *n. s.* 1. The part of the ecliptic at any particular time above the horizon, which is ſuppoſed by aſtrologers to have great influence.—2. Height; elevation.—3. Superiority; influence.—4. One of the degrees of kindred reckoned upwards.

ASCENDENCY, *n. s.* influence; power.

ASCENDING SIGNS, among aſtrologers, are thoſe which are upon their aſcent, or riſe, from the nadir, or loweſt part of the heavens, to the zenith, or higheſt.

Ascending vessels, in anatomy, thoſe which carry the blood upwards; as the aorta aſcendens. See Anatomy.

ASCENSION, *n. s.* 1. The act of aſcending or riſing; frequently applied to the viſible elevation of our Saviour to heaven.—2. The thing riſing, or mounting.

Ascension, in aſtronomy, is either *right* or *oblique*. *Right aſcenſion* of the ſun, or a ſtar, is that degree of the equinoctial, counted from the Aries, which riſes with the ſun or ſtar in a right ſphere. *Oblique aſcenſion* is an arch of the equator intercepted between the firſt point of Aries, and that point of the equator which riſes together with a ſtar in an oblique ſphere.

Ascension, in geography, an uninhabited barren iſland in the South Atlantic Ocean, about 10 miles in length and 5 or 6 in breadth. It lies 600 miles N. W. of St. Helena, and in a due E. and W. line, is much nearer South America than Africa, though in ſome geographies, it is ſaid to be ſituated on the coaſt of the latter. It has a ſafe harbour, at which Eaſt India ſhips often touch to procure turtles, which are found here in great numbers, and ſome of them ſo large that they are ſaid to weigh from 4 to 500 pounds. There is a ſpring of good water on this iſland at the foot of a mountain, called Green Mountain. Long. 60. 42. E. Lat. 8. S.

Ascension, a large bay in the Gulph of Honduras, on the eaſt ſide of the peninſula of Yucatan. It has Lumber Bay on the north.

Ascension is alſo the name of a bay in the north part of the Gulph of Mexico, ſituated in 30 N. Lat. and 16. 47. W. Long. It is on the coaſt of Louiſiana, and has Wood's Bay on the E. and North Cape on the W.

Ascension day, the day on which the aſcenſion of our Saviour is commemorated, commonly called Holy Thurſday; the Thurſday but one before Whitſuntide.

ASCENSIONAL DIFFERENCE, is the difference between the right and oblique aſcenſion of the ſame point to the ſurface of the ſphere.

Ascensional difference of the ſun, converted into time, is juſt ſo much as he riſes before or after ſix o'clock.

ASCENT, *n. s.* 1. Riſe; the act of riſing; the act of mounting.—2. The way by which one aſcends.—3. An eminence or high place.

Ascent, in aſtronomy, &c. See Ascension.

Ascent, in phyſics, implies the motion of a body upwards, or the continual receſs of a body from the earth. The Peripatetics attributed the ſpontaneous *aſcent* of bodies to a principle of *levity* inherent in them. The moderns deny ſpontaneous levity; and ſhow, that whatever aſcends, does it in virtue of ſome external impulſe or extruſion. Thus ſmoke and other rare bodies aſcend in the atmoſphere; and oil, light woods, &c. in water; not by any internal principle of levity, but by the ſuperior gravity or tendency downwards of the parts of the medium where they are. The aſcent of light bodies in heavy mediums is produced after the ſame manner as the aſcent of a lighter ſcale of a balance. It is not that ſuch ſcale has an internal principle whereby it immediately tends upwards; but it is impelled upwards by the preponderancy of the other ſcale; the exceſs of the weight of the one having the ſame effect, by augmenting its impetus downwards, as ſo much real levity in the other; by reaſon the tendencies mutually oppoſe each other, and that action and reaction are always equal.

Ascent of bodies on inclined planes. See Mechanic.

Ascent of fluids. See Hydrostatics.

Ascent of vapours. See Evaporation.

To ASCERTAIN, *v. a.* 1. To make certain; to fix; to eſtabliſh.—2. To make confident; to take away doubt.

ASCERTAINMENT, *n. s.* a ſettled rule; an eſtabliſhed ſtandard.

ASCETICS, perſons in the primary times, who devoted themſelves to the exerciſes of piety, in a retired life; and particularly to prayer, abſtinence, and mortification. Afterwards, this title was beſtowed upon the monks, eſpecially ſuch of them as lived in ſolitude. Aſcetics is alſo a title of ſeveral books of ſpiritual exerciſes; as, the *Aſcetics*, or devout exerciſes of St. Baſil, &c.

ASCIDIA, a genus of animals belonging to the order of vermes molluſca. The body is cylindrical, and fixed to a ſhell, rock, &c. It has two apertures; one on the ſummit, the other lower, forming a ſheath. There are ſix ſpecies of this animal, viz. The Papilloſum, Gelatinoſum, Inteſtinalis, Quadrientata, Ruſtica, and Echinata. Animals of this genus have the faculty of ſquirting out the water they take in. The expanſion and contraction of other bodies occaſion their aſſuming various forms.

ASCII, *n. s.* *It has no ſingular.* Thoſe people who, at certain times of the year, have no ſhadow at noon; ſuch are the inhabitants of the torrid zone, becauſe they have the ſun twice a-year vertical to them.

ASCITES, *n. s.* a particular ſpecies of dropſy; affecting thereby the abdomen, or lower belly. The *aſcites* is the ordinary water dropſy. For a particular deſcription of this diſeaſe, its cauſes, &c. See Medicine.

ASCITICAL, } *adj.* belonging to an aſcites; dropſical;
ASCITICK, } hydropical.

ASCITITIOUS, *adj.* ſupplemental; additional; not inherent; not original.

ASCRIBABLE, *adj.* which may be aſcribed.

To ASCRIBE, *v. a.* 1. To attribute as a cauſe.—2. To attribute as a quality to perſons, or accident to ſubſtance.

ASCRIPTION, *n. s.* the act of aſcertaining.

ASCRIPTITIOUS, *ad.* that which is aſcribed.

ASH, *n. s.* in botany, the Engliſh name of the genus Fraxinus, which ſee.

ASHAMED, *adj.* touched with ſhame.

ASH-COLOURED, *adj.* coloured between brown and grey, like the bark of an aſhen branch.

ASHEN, *adj.* made of aſh wood.

ASHEPOO, a river of S. Carolina, which riſes in Charleſton diſtrict, and running S. by E. enters St. Helena Sound by two channels, on the W. ſide of Fenwick's Iſland. It is navigable by boats for 10 or 12 miles.

ASHES, *n. s. wants the ſingular.* 1. The remains of any thing burnt.—2. The remains of the body; often uſed in poetry for the carcaſe, from the ancient practice of burning the dead.

Ashes, in chemiſtry, the earthy particles of combuſtible ſubſtances after they have been burnt. If the aſhes are produced from vegetable bodies, they contain a conſiderable quantity of fixed ſalt, blended with the terrene particles: and from theſe aſhes the alkaline ſalts called *pot-ash*, *pearl-ash*, &c. are extracted. See Pot-ash, &c. The aſhes of all vegetables are vitrifiable, and found to contain iron.—They are alſo an excellent manure for cold and wet grounds. See Husbandry.

Ashes were anciently uſed in ſeveral religious ceremonies. St. Jerome relates, that the Jews in his time rolled themſelves in aſhes, as a ſign of mourning. To repent in ſackcloth and aſhes, is a frequent expreſſion in Scripture for mourning and being afflicted for our ſins.

ASHLAR. *n. s.* free ſtones as they come out of the quarry, of different lengths, breadths, and thickneſſes.

ASHLERING, *n. s.* quartering in garrets, about two foot and a half or three foot high, perpendicular to the floor, and reaching to the underſide of the rafters.

ASHORE, *adv.* 1. On ſhore; on the land.—2. To the ſhore; to the land.

ASHUELOT, a river of the United States, in New-Hampſhire, formed by a great number of ſtreams which flow from ponds in Cheſhire county, and unite at Swanſy; when running S. W. it falls into Connecticut river, four miles N. of Maſſachuſetts.

ASHWEDNESDAY, *n. s.* the firſt day of Lent, ſo called from the ancient cuſtom of ſprinkling aſhes on the head.

ASHWEED, *n. s.* an herb.

ASHY, *adj.* aſh-coloured; pale; inclined to a whitiſh grey.

ASIA, is one of the three general diviſions of the eaſtern continent or hemiſphere, and one of the four of the whole earth. It is ſeparated from Europe by the Mediterranean Sea, the Archipelago, the Black Sea, the Palus Meotis, the Don, and the Dwina, which fall into the White Sea; and from Africa, by the Arabic Gulph, or Red Sea, and the Iſthmus of Suez. All the other parts are ſurrounded by the ocean. The late diſcoveries ſhow that it does not join to America, though it extends very near it. It is ſituated between 119. E. and 39. W. Long. and 1. and 78. lat. N. From the Dardanelles to the moſt eaſtern ſhore of Tartary, it is 4740 miles in length; and from the moſt ſouthern point of Malacca to the moſt northern point of Nova Zembla, it is 4380 miles in breadth.

Aſia may be divided into the following parts: Turkey in Aſia, Arabia, Perſia, the Mogul's empire, with the two peninſulas of the Indies; Tibet, China, and Korea; Great and Little Buckaria, with Koraſin; Tartary, Siberia, and the iſlands. The principal languages ſpoken in Aſia are, the modern Greek, the Turkiſh, the Ruſſian, the Tartarian, the Perſian, the Arabic, the Malayan, the Chineſe, and the Japaneſe. The European languages are alſo ſpoken upon the coaſts of India and China. Aſia is looked upon as that part of the world which, of all others, has been moſt peculiarly diſtinguiſhed by heaven. There it was the firſt man was created; there the patriarchs lived, the law was given to Moſes, and the greateſt and moſt celebrated monarchies were formed; from thence the firſt founders of cities and nations in other quarters of the world brought their colonies. Laſtly, in Aſia Jeſus Chriſt appeared: and there it was that he wrought the ſalvation of mankind, that he died and roſe again; and from thence it is that the light of the goſpel was diffuſed over all the world. Laws, arts, ſciences, and religion, almoſt all had their original in Aſia.

This vaſt extent of territory was ſucceſſively governed in paſt times by the Aſſyrians, the Medes, the Perſians, and the Greeks; but the immenſe regions of India and China were little known to Alexander, and the conquerors of the ancient world. Upon the decline of thoſe empires, great part of Aſia ſubmitted to the Roman arms; and afterwards, in the middle ages, the ſucceſſors of Mahomet, or, as they are uſually called, Saracens, founded in Aſia, in Africa, and in Europe, a more extenſive empire than that of Cyrus, Alexander, or even the Roman when in its height of power. The Saracen greatneſs ended with the death of Tamerlane; and the Turks, conquerors on every ſide, took poſſeſſion of the middle regions of Aſia, which they ſtill enjoy. Beſides the countries poſſeſſed by the Turks and Ruſſians, Aſia contains at preſent three large empires, the Chineſe, the Mogul, and the Perſian; upon which the leſſer kingdoms and ſovereignties of Aſia generally depend. The prevailing form of government in this diviſion of the globe is abſolute monarchy. If any of them can be ſaid to enjoy ſome ſhare of liberty, it is the wandering tribes, as the Tartars and Arabs. Many of the Aſiatic nations, when the Dutch firſt came among them, could not conceive how it was poſſible for any people to live under any other form of government than that of a deſpotic monarch. Turkey, Arabia, Perſia, part of Tartary, and part of India, profeſs Mahometaniſm. In the other parts of Tartary, India, China, Japan, and the Aſiatic Iſlands, they are generally heathens and idolaters: and Jews are to be found every where in Aſia. Chriſtianity, though planted here with wonderful rapidity by the apoſtles and primitive fathers, ſuffered an almoſt total eclipſe by the conqueſts of the Saracens, and afterwards of the Turks.

The Aſiatic iſlands are very numerous, inſomuch that ſome reckon 150,000; but of this there is no certainty. However they may be divided into thoſe of the E. W. S. and S. E. Thoſe that lie on the E. of Aſia are, the iſlands of Jeſſo or Yedſo, and Japan, with ſeveral ſmall ones on the coaſt of Korea, the iſland Formoſa, and the Philippines. Thoſe on the W. are, the iſland of Cyprus, in the Mediterranean; Scandaroon, off Natolia, and the iſle of Rhodes, off Phiſchio, on the ſame coaſt. Thoſe on the S. are, the iſles of the Maldives, in the Indian Sea; the iſle of Ceylon, off cape Komorin; with a great many ſmall ones in the gulph of Bengal. Thoſe on the S. E. are, the iſles of Sandi, as Sumatra, the iſles of Java, Borneo, &c. the Moluccas, the iſles of Kumbaya, Timor, &c.

The chief rivers of Aſia are, the Euphrates and Tigris, in Turkey; the Indus and Ganges, in India; the Kiang and Hoang-ho, in China; the Sir Amu and Wolga, in Weſtern Tartary; the Saghalia Ula or Amur, in Eaſtern Tartary; the Irtiſh, Oby, Jeniſca, and Lena in Siberia. The lakes are, that prodigious one called the *Caſpian Sea*; and near that another very large one, but lately known to us, called *Aral*, or the lake of eagles. The Baykal is in Siberia, the Kokonor near Tibet, and the Tong Ping in China. The chief mountains are, the Taurus in Turkey and Perſia; the Imaus, between India and Tibet; and the Altay, in Tartary.

As Aſia exceeds the other two parts of the eaſtern continent, Europe and Africa, ſo it is ſuperior to them in the ſerenity of its air, fertility of its ſoil, the delicioufneſs of its fruits, the fragrancy and balſamic qualities of its plants, ſpices, and gums; the ſalubrity of its drugs; the quantity, variety, beauty, and value of its gems; the richneſs of its metals, and the fineneſs of its ſilks and cottons. A great change indeed hatk happened in that part of it called Turkey, which hath loſt moſt of its ancient ſplendor, and from the moſt populous and beſt cultivated ſpot in Aſia, is become a wild and uncultivated deſart. The other parts of Aſia continue much in their former condition; the ſoil being as remarkable for its fertility, as moſt of the inhabitants are for their indolence, effeminacy, and luxury. This effeminacy is chiefly owing to the warmth of the climate, though in ſome meaſure heigthened by cuſtom and education; and the ſymptoms of it are more or leſs viſible as the ſeveral nations are ſeated nearer or farther from the north.

Asia minor, or lesser; the ſame with Natolia. See Natolia.

ASIATIC, *adj.* produced in Aſia; of or belonging to Aſia.

ASIDE, *adv.* 1. To one ſide; out of the perpendicular direction.—2. To another part; out of the true direction.

ASILUS, in entomology, the hornet fly, a genus of inſects belonging to the order of inſecta diptera. It has two wings; and a horny, ſtrait, two-valved beak. There are 17 ſpecies of this inſect. Many of them wound in a very painful manner, and are particularly troubleſome to cattle in low meadows; others of them are quite harmleſs. See Plate XIII. fig. 25.

ASINARY, or Asinine, *adj.* belonging to an aſs.

ASINUS, *n. s.* the aſs, a ſpecies of equus. See Equus.

To ASK, *v. a.* 1. To petition; to beg.—2. To demand; to claim: as, to *ask* a price for goods.—3. To queſtion.—4. To require, as phyſically neceſſary.

To Ask, *v. n.* 1. To petition; to beg.—2. To make enquiry.

ASKANCE,
ASKAUNCE,
or ASKAUNT, } *adv.* ſideways; obliquely.

ASKER, *n. s.* 1. Petitioner.—2. Enquirer.

ASKEW, *adv.* aſide; with contempt.

ASLANT, *adv.* obliquely; on one ſide; not perpendicularly.

ASLEEP, *adv.* 1. Sleeping; at reſt.—2. To ſleep.

ASLOPE, *adv.* with declivity; obliquely; not perpendicularly.

ASP. Aspick, *n. s.* a kind of ſerpent, whoſe poiſon kills without a poſſibility of applying any remedy.—It is ſaid to be very ſmall, and peculiar to Egypt and Lybia. Thoſe that are bitten by it, die within three hours; the manner of their dying being by ſleep without any pain.

Asp is ſaid to be thus denominated from the Greek *aspis*, *shield*, on account of its lying convolved in a circle, in the centre of which is the head, which it exerts, or raiſes, like the umbo or umbilicus of a buckler. This ſpecies of ſerpent is very frequently mentioned by authors; but ſo careleſsly deſcribed, that it is not eaſy to determine which, if any of the ſpecies known at preſent, may properly be called by this name. It is ſaid to be common in Africa, and about the banks of the Nile; and Bellonius mentions a ſmall ſerpent which he had met with in Italy, and which had a ſort of callous excreſcence on the forehead, which he takes to have been the aſpis of the ancients. It is with the aſp that Cleopatra is ſaid to have diſpatched herſelf, and prevented the deſigns of Auguſtus, who intended to have carried her captive to adorn his triumphal entry into Rome.

Asp, *n. s.* a tree. See Populus.

ASPALATHUS, *n. s.* 1. A plant called the roſe of Jeruſalem, or our lady's roſe.—2. The wood of a prickly tree, heavy, oleaginous, ſomewhat ſharp and bitter to the taſte.

ASPARAGUS, sparagus, sperage, or sparrow-grass: A genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method, ranking under the 11th order, Sarmentaceæ. The calyx is quinquepartite, and erect; the three inferior petals are bent outwards; the berry has three cells, and contains two ſeeds. There are 10 ſpecies; but the only one cultivated in the gardens is the common aſparagus, with an upright herbaceous ſtalk, briſtly leaves, and equal ſtipula. The other ſpecies are kept only in the gardens of the curious, for the ſake of variety. For the mode of cultivating aſparagus, ſee Gardening.

ASPECT, *n. s.* 1. Look; air; appearance.—2. Countenance; look.—3. Glance; view; act of beholding.—4. Direction towards any point; view; poſition.—5. Diſpoſition of any thing to ſomething elſe; relation.—6. Diſpoſition of a planet to other planets.

ASPECTABLE, *adj.* viſible; being the object of ſight.

ASPECTION, *n. s.* beholding; view.

ASPEN, *adj.* 1. Belonging to the aſp tree.—2. Made of aſpen wood.

Aspen, or Asp tree, in botany. See Populus.

ASPER, in commerce, or aspre, a little Turkiſh ſilver coin, wherein moſt of the grand ſignior's revenues are paid. The *asper* is worth about a cent. The only impreſſion it bears, is that of the prince's name under whom it was ſtruck.

Asper, in grammar, an accent peculiar to the Greek language, marked thus (ʻ); and importing, that the letter over which it is placed ought to be ſtrongly aſpirated, or pronounced as if an *h* were prefixed.

To ASPERATE, *v. a.* to roughen; to make rough or uneven.

ASPERATION, *n. s.* a making rough.

ASPERITY, *n. s.* 1. Unevenneſs; roughneſs of ſurface.—2. Roughneſs of ſound; harſhneſs of pronunciation.—3. Roughneſs, or ruggedneſs of temper; moroſeneſs; ſourneſs; crabbedneſs.

To ASPERSE, *v. a.* to beſpatter with cenſure or calumny.

ASPERSION, *n. s.* 1. A ſprinkling.—2. Calumny; cenſure.

ASPHALTIC, *adj* gummy; bituminous.

ASPHALTITES, a lake of Judea, ſo called from the great quantity of bitumen it produces; called alſo the *Dead Sea;* and from its ſituation, the *East Sea;* the *Salt Sea,* the

Sea of Sodom, the *Sea of the Deſart*, and the *Sea of the Plain*, by the ſacred writings. It is incloſed on the E. and W. by exceeding high mountains, many of them craggy and dreadful to behold. On the N. it has the plain of Jericho; or, if we take in both ſides of the Jordan, it has the Great Plain, properly ſo called, on the S. which is open, and extends beyond the reach of the eye. Joſephus makes this lake 580 furlongs in length, from the mouth of the Jordan to the town of Segor, on the oppoſite end, that is about 22 leagues; and about 150 furlongs, or five leagues, in its largeſt breadth: but our modern accounts commonly give it 24 leagues in length, and ſix or ſeven in breadth.

Many things have been ſaid and written of this lake; ſuch as that it aroſe from the ſubmerſion of the vale of Siddim, where once ſtood, as is commonly reported, the three cities which periſhed in the miraculous conflagration, with Sodom and Gomorrah, for their unnatural and deteſtable wickedneſs: on which account this lake has been looked upon as a laſting monument of the juſt judgment of God, to deter mankind from ſuch abominations. Hence it is added, that the waters of the lake are ſo impregnated with ſalt, ſulphur, and other bituminous ſtuff, that nothing will ſink or live in it; and that it caſts ſuch ſtench and ſmoke, that the very birds die in attempting to fly over it. The deſcription likewiſe of the apples that grew about it, fair without, and only aſhes and bitterneſs within, were looked upon as a farther monument of God's anger. Many travellers have alſo deſcribed not only the lake, but all the country round about, as appearing dreadful to behold, all ſulphureous, bituminous, ſtinking, and ſuffocating: and laſtly, it hath been affirmed that the ruins of the five cities are ſtill to be ſeen in clear weather, and have been actually ſeen in theſe latter times.

All theſe ſurpriſing things, however, though commonly, and long received, have been of late much exploded, not only by the teſtimony of very credible witneſſes, but even by arguments drawn from ſcripture, that we muſt give them up as inventions, unleſs we will ſuppoſe the face and nature of all theſe things to have been entirely changed. Thoſe, in particular, of bodies not ſinking in the water, and of birds being ſtifled by the exhalations of it, appear now falſe in fact. It is true, the quantity of ſalt, alum and ſulphur, with which it is impregnated, render it ſo much ſpecifically heavier (Dr. Pococke ſays one fifth) than freſh water, that bodies will not ſo eaſily ſink: yet that author, and others, aſſure us, they have ſwam and dived in it; and, as to the birds, we are told likewiſe, that they will fly over it without any harm. To reconcile theſe things with the experiments, which, Pliny tells us, had been made by Veſpaſian, is impoſſible, without ſuppoſing that thoſe ingredients have been ſince much exhauſted, which, indeed, is not at all improbable; ſuch quantities of them, that is, of the bitumen and ſalt, having been all along, and being ſtill taken off, and ſuch ſtreams of freſh water continually pouring into it, as may reaſonably be ſuppoſed to have conſiderably diminiſhed its gravity and denſeneſs.

The unhealthineſs of the air about this lake was affirmed by Joſephus and Pliny, eſpecially on the weſt. The monks that live in the neighbourhood confirm this, and would have diſſuaded Dr. Pococke from going to it on that account; and, as he ventured to go and bathe in it, and was, two days after, ſeized with a dizzineſs, and violent pain in the ſtomach which laſted near three weeks, they made no doubt but it was occaſioned by it; and he doth not ſeem to contradict them. As to the water, it is, though clear, ſo impregnated with ſalt, that thoſe who dive into it come out covered with a kind of ſaline matter. There is one remarkable thing relating to this lake, generally agreed on by all travellers and geographers; viz. that it receives the waters of Jordan, a conſiderable river, the brooks of Jabbok, Kiſhon, Arnon, and other ſprings, which flow into it from the adjacent mountains, and yet never overflows, though there is no viſible way to be found by which it diſcharges that great influx. Some naturaliſts have been greatly embarraſſed to find a diſcharge for theſe waters; and have therefore been inclined to ſuſpect the lake had a communication with the Mediterranean. But, beſides that we know of no gulph to corroborate this ſuppoſition, it has been demonſtrated by accurate calculations, that evaporation is more than ſufficient to carry off the waters brought by the rivers. It is, in fact, very conſiderable; and frequently becomes ſenſible to the eye, by the fogs with which the lake is covered at the riſing of the ſun, and which are afterwards diſperſed by the heat. It is to be obſerved here, that the name of *Dead Sea* is not to be found in the ſacred writings; but has been given to this lake becauſe no creature will live in it, on account of its exceſſive ſaltneſs, or rather bituminous quality; for the Hebrews rank ſulphur, nitre, and bitumen, under the general name of *ſalt*. However, ſome late travellers have found cauſe to ſuſpect the common report of its breeding no living creature; one of them having obſerved, on the ſhore, two or three ſhells of fiſh like thoſe of the oyſter, and which he ſuppoſes to have been thrown up by the waves, at 2 leagues diſtance from the mouth of the Jordan, which he there takes notice of, leſt they ſhould be ſuſpected to have been brought into the lake by that way. And Dr. Pococke, though he neither ſaw fiſh nor ſhells, tells us, on the authority of a monk, that ſome ſort of fiſh had been caught in it; and gives us his opinion, that as ſo many ſorts live in ſalt water, ſome kind may be ſo formed as to live in a bituminous one. Mr. Volney, however, affirms, that it contains neither animal nor vegetable life; we ſee no verdure on its banks, nor are fiſh to be found within its waters. But he adds, that it is not true that its exhalations are peſtiferous to deſtroy birds flying over it. "It is very common (ſays he) to ſee ſwallows ſkimming its ſurface, and dipping for the wares neceſſary to build their neſts. The real cauſe which deprives it of vegetables and animals is the extreme ſaltneſs of the water, which is infinitely ſtronger than that of the ſea. The ſoil around it, equally impregnated with this ſalt, produces no plants; and the air itſelf, which becomes loaded with it from evaporation, and which receives alſo the ſulphureous and bituminous vapours, cannot be favourable to vegetation: hence the deadly aſpect which reigns around this lake. In other reſpects, the ground about it, however, is not marſhy; and its waters are limpid and incorruptible, as muſt be the caſe with a diſſolution of ſalt. The origin of this mineral is eaſy to be diſcovered; for on the ſouth-weſt ſhore are mines of foſſil ſalt, of which I have brought away ſeveral ſpecimens. They are ſituated on the ſide of the mountains which extend along that border; and, for time immemorial, have ſupplied the neighbouring Arabs, and even the city of Jeruſalem. We find alſo on this ſhore

t, *v. a.* to attack; to invade; to fall upon
.

ER, *n. s.* one who violently aſſaults another.
s. 1. Examination; trial.—2. The firſt en-
ny thing; a taſte for trial.—3. Trial by dan-
; difficulty; hardſhip.

ssay, or Say, in metallurgy, the proof or trial
eſs, purity, value, &c. of metals and metalline
See Essay.

v. a. 1. To make trial of; to make experi-
. To apply to, as the touch-ſtone in *assaying*
. To try; to endeavour.

lance. See Balance.

n. s. an officer of the mint, for the trial of
; act of Congreſs for eſtabliſhing a mint,
the duty of the *assayer* to " receive and give
metals, which may lawfully be brought to
be coined; to aſſay all ſuch of them as ſhall
and to deliver them to the chief coiner to be
From every ſeparate maſs of ſtandard gold or ſil-
ſhall be made into coins at the ſaid mint, there
ken and ſet apart by the treaſurer, and reſerved
ſtody, a certain number of pieces, not leſs than
nd once in every year the pieces ſo ſet apart
rved, ſhall be aſſayed under the inſpection of the
e of the United States, the Secretary and
of the Treaſury, the Secretary for the Depart-
e, and the Attorney General of the United
are required to attend for that purpoſe at the
, on the laſt Monday of July in every year) or
e of them, in ſuch manner as they or a majority of
ll direct, and in the preſence of the director, aſ-
d chief coiner of the ſaid mint; and if it ſhall be
hat the gold and ſilver ſo aſſayed, ſhall not be in-
their reſpective ſtandards more than one part in
d and forty-four, the officer or officers of the
whom it may concern, ſhall be held excuſable;
y greater inferiority ſhall appear, it ſhall be cer-
the Preſident of the United States, and the ſaid
r officers ſhall be deemed diſqualified to hold their
e offices.

YING, ars docimastica, in its extent, com-
particular manners of examing every ore, or mixed
ccording to its nature, with the beſt adapted fluxes;
diſcover, not only what metals, and what proper-
metals are contained in ores; but likewiſe how
lphur, vitriol, alum, arſenic, ſmelt, &c. may be ob-
rom every one reſpectively.—See Blow-pipe, Me-
gy, and Mineralogy. Aſſaying is particularly
coiners and goldſmiths, for trying the purity of the
l ſilver to be uſed in the coining of money, and ma-
e of plate, &c. or that have been already uſed

There are two kinds of aſſaying; the one before
re melted, in order to bring them to their proper
the other after they are ſtruck, to ſee that they be
.

MBLAGE, *n. s.* 1. A collection; a number of
als brought together.—The ſtate of being aſſem-
Likewiſe, the things themſelves ſo united. It is alſo
a more general ſenſe, for a colection of various
o diſpoſed and diverſified, that the whole produces
reeable effect.

To ASSEMBLE, *v. a.* to bring into one place.

To Assemble, *v. n.* to meet together-

ASSEMBLY, *n. s.* a company met together; a legiſlative body.

Assembly, in the beau monde, an appointed meeting of faſhionable perſons of both ſexes, for the ſake of play, dancing, gallantry, converſation, &c.

Assembly, in the military art, the ſecond beating of a drum before a march; at which the ſoldiers ſtrike their tents, roll them up, and ſtand to arms.

ASSENT, *n. s.* 1. The act of agreeing to any thing.—2. Conſent; agreement.

To Assent, *v. n.* to concede; to yield to, or agree to.

ASSENTATION, *n. s.* compliance with the opinion of another out of flattery or diſſimulation.

To ASSERT, *v. a.* 1. To maintain; to defend either by words or actions.—2. To affirm; to declare poſitively. 3. To claim; to vindicate a title to.

ASSERTION, *n. s.* the act of aſſerting; or it may be more accurately defined, a fact or propoſition advanced by the aſſertor, who avows the truth of it.

ASSERTIVE, *adj.* poſitive; dogmatical; peremptory.

ASSERTOR, *n. s.* maintainer; vindicator; ſupporter; affirmer.

ASSESS, *v. a.* to charge with any certain ſum.

ASSESSMENT, *n. s.* 1. The ſum levied on certain property.—2. The act of aſſeſſing.

ASSESSOR, *n. s.* 1. The perſon who ſits by another; generally uſed of thoſe who aſſiſt the judge.—2. He who lays taxes.

ASSETS, *n. s.* *without the singular.* Goods ſufficient to diſcharge that burden, which is caſt upon the executor or heir, in ſatisfying the teſtators or anceſtors debts or legacies.

To ASSEVER, } *v. a* to affirm with great ſolemni-
To ASSEVERATE, } ty, as upon oath.

ASSEVERATION, *n. s.* ſolemn affirmation upon oath.

ASSHEAD, *n. s.* one ſlow of apprehenſion; a blockhead.

ASSIDUITY, *n. s.* diligence; cloſeneſs of application.

ASSIDUOUS, *adj.* conſtant in application.

ASSIDUOUSLY, *adv.* diligently; continually.

ASSIGN, in common law, a perſon to whom a thing is aſſigned, or made over. The word aſſign is ſaid to have been introduced in favour of natural children; who, becauſe they cannot paſs by the name of heirs, are comprized under that of aſſigns.

To Assign, *v. a.* 1. To make out; to appoint.—2. To fix with regard to quantity or value.—3. [In law] in general, to appoint a deputy, or make over a right to another; in particular, to point or ſet forth, as to *assign* error, is to ſhew in what part of the proceſs error is committed; to *assign* falſe judgment, is to declare how and where the judgment is unjuſt; to *assign* the ceſſor, is to ſhew how the plaintiff had ceſſed, or given over; to *assign* waſte, is to ſhew wherein eſpecially the waſte is committed.

ASSIGNABLE, that which may be marked out or fixed.

ASSIGNATION, *n. s.* 1. An appointment to meet; uſed generally of love appointments.—2. A making over a thing to another.

ASSIGNATS, a ſpecies of paper currency, iſſued by the government of France, for ſums of different value, to the amount of many thouſand millions of livres, to ſupport the credit of the republic, during the courſe of the late revolution. Like the paper dollars of America, and all ſimilar meaſures adopted by nations in a revolutionary ſtate, they ſuffered an aſtoniſhing depreciation; although the whole landed property of the nation was pledged for the ſecurity of the holders. To remedy the inconveniences ariſing from this depreciation, which indeed, was a natural conſequence not only of the fluctuating ſtate of the French government, but alſo of the ſecurity being *too general*, and not *ſpecific*, as all financial ſecurities ought to be, the French Directory, a ſhort time beforethe annihilation of that body, iſſued a new ſpecies of currency, called *Mandats Territoriaux;* which inſtead of reſting on the *whole* landed property of the nation, were bottomed only upon ſo much of that property, as was equivalent in value to the maſs of mandats iſſued; which was 2400 millions of livres, or 444 millions of dollars. See Mandats.

ASSIGNEE, *n. s.* he who is appointed or deputed by another to do any act, or perform any buſineſs, or enjoy any commodity.

ASSIGNER, *n. s.* he who appoints.

ASSIGNMENT, *n. s.* 1. Approbation of one thing to another thing or perſon.—2. The act of transferring the intereſt or property a man has in any thing; or of appointing or ſetting over a right to another.

ASSIMILABLE, *adj.* that which can be converted to the ſame nature with ſomething elſe.

To ASSIMILATE, *v. a.* 1. To bring to a likeneſs or reſemblance.—2. To turn to its own nature by digeſtion.

To Assimilate, *v. n.* to perform the act of converting food to nouriſhment.

ASSIMILATION, *n. s.* 1. The act of converting any thing to the nature or ſubſtance of another.—2. The ſtate of being aſſimilated, or becoming like ſomething elſe.

To ASSIMULATE, *v. a.* to feign; to counterfeit.

ASSIMULATION, *n. s.* a diſſembling; a counterfeiting.

ASSISOR, the ſame with Assessor or Assizer.

To ASSIST, *v. a.* to help.

ASSISTANCE, *n. s.* help; furtherance.

ASSISTANT, *adj.* helping; lending aid.

Assistant, *n. s.* a perſon engaged in an affair not as principal, but as an auxiliary.

ASSIZE, *n. s.* 1. An aſſemblage of ſubſtantial men, with the baliff or juſtice, in a certain place, and at a certain time.—2. A jury.—3. An ordinance or ſtatute.—4. The court, place, or time, where and when the writs and proceſſes of *aſſize* are taken.—5. Any court of juſtice.—6. *Aſſize of bread, ale*, &c. Meaſure of price or rate. Thus it is ſaid, *when wheat is of such a price, the bread shall be of such* aſſize.—7. Meaſure for which we now uſe *ſize*.

To Assize, *v. a.* to fix the rate of any thing by an *aſſize* or writ.

ASSIZER, or Assiser, *n. s.* an officer who has the care and overſight of weights and meaſures.

ASSOCIABLE, *adj.* that which may be joined together.

ASSOCIATE, *adj.* confederate; joined in intereſt or purpoſe.

Associate, *n. s.* 1. A perſon joined with another; a partner.—2. A confederate, in a good or neutral ſenſe; an accomplice in ill.—3. A companion; implying ſome kind of equality.

Associate presbytery, the title firſt aſſumed by thoſe clergymen, who ſeceeded from the eſtabliſhed church of Scotland, in 1733. It is alſo the name of the higheſt eccleſiaſtical court of the Antiburger Seceders in the United States. See Seceeders.

Associate synod, the higheſt eccleſiaſtical court among the Antiburgher Seceeders. See Seceders.

Associate reformed synod, the higheſt eccleſiaſtical court of a reſpectable body of Chriſtians in the United States, who have adopted the religious principles and doctrines of the Antiburghers, without their local peculiarities. They are ſtrict Calviniſts, and more rigid adherers to church diſcipline than moſt other religious ſocieties amongſt us. Under this ſynod, there are ſeveral preſbyteries, viz. in New-York, Pennſylvania, Virginia, Kentucky, &c. See Reformed Church and Seceders.

To Associate, *v. a.* 1. To unite with one another as a confederate.—2. To adopt as a friend upon equal terms.—3. To accompany; to keep company with another.—4. To unite; to join.

ASSOCIATION, *n. s.* 1. Union; conjunction; ſociety.—3. Confederacy; union for particular purpoſes, good or ill.—3. Partnerſhip.—4. Connection.—5. Appoſition; union of matter.

Association of ideas, is where two or more ideas conſtantly and immediately accompany or ſucceed one another in the mind, ſo that one ſhall almoſt infallibly produce the other, whether there be any natural relation between them or not. See Metaphysics. Where there is a real affinity or connection in ideas, it is the excellency of the mind, to be able to collect, compare, and range them in order, in its inquiries: but where there is none, nor any cauſe to be aſſigned for their accompanying each other, but what is owing to mere accident or habit; this unnatural aſſociation becomes a great imperfection, and is, generally ſpeaking, a main cauſe of error, or wrong deductions in reaſoning. Thus the idea of goblins and ſprights has really no more affinity with darkneſs than with light; and yet let a fooliſh maid inculcate theſe ideas often on the mind of a child, and raiſe them there together, it is poſſible he ſhall never be able to ſeparate them again ſo long as he lives, but darkneſs ſhall ever bring with it thoſe frightful ideas. With regard to this inſtance, however, it muſt at the ſame time be obſerved, that the connection alluded to appears far from being either unnatural or abſurd. See Apparition. Such wrong combinations of ideas, Mr. Locke ſhows, are a great cauſe of the irreconcileable oppoſition between the different ſects of philoſophy and religion: for we cannot imagine, that all who hold tenets different from, and ſometimes even contradictory to, one another, ſhould wilfully and knowingly impoſe upon themſelves, and refuſe truth offered by plain reaſon: but ſome looſe and independent ideas are by education, cuſtom, and the conſtant din of their party, ſo coupled in their minds, that they always appears there together: theſe can no more ſeparate in their thoughts, than if they were but one idea, and they operate as if they were ſo. This gives the appearance of ſenſe to jargon, of demonſtration to abſurdities, and of conſiſtency to nonſenſe, It is the foundation of the greateſt, and almoſt of all, the errors of the world. Aſſociation forms a principal part of Dr. Hartley's theory of the mind. He diſtinguiſhes it into ſynchronous and ſucceſſive; and aſcribes our ſimple and complex ideas to the influence of this principle or habit. Particular ſenſations reſult from previous vibrations conveyed through the nerves to the medullary ſubſtance of the brain; and theſe are ſo intimately aſſociated together, than any one of them, when impreſſed alone, ſhall be able to excite in the mind the ideas of all the reſt. Thus we derive the ideas of natural bodies from the aſſociation of the ſeveral ſenſible qualities with the names that expreſs them, and with each other. The ſight of part of a large building ſuggeſts the idea of the reſt inſtantaneouſly, by a ſynchronous aſſociation of the parts; and the ſound of the words, which begin a familiar ſentence, brings to remembrance the remaining parts, in order, by ſucceſſive aſſociation. Dr. Hartley maintains, that ſimple ideas run into complex ones by aſſociation; and apprehends, that by purſuing and perfecting this doctrine, we may ſome time or other be enabled to analyſe thoſe complex ideas, that are commonly called the *idea of reflection*, or *intellectual ideas*, into their ſeveral component parts, i. e. into the ſimple ideas of ſenſation of which they conſiſt; and that this doctrine may be of conſiderable uſe in the art of logic, and in explaining the various phenomena of the human mind.

ASSONANCE, *n. s.* reference of one ſound to another reſembling it. Reſemblance of ſound.

ASSONANT, *adj.* ſounding in a manner reſembling another ſound.

To ASSORT, *v. a.* to range in claſſes, as one thing ſuits with another.

ASSORTMENT, *n. s.* 1. The act of claſſing or ranging.—2. A maſs or quantity properly ſelected or ranged.

To ASSUAGE, *v a* 1. To mitigate; to ſoften; to allay.—2. To appeaſe; to pacify.—3. To eaſe; as, the medicine *aſſuages* pain.

To Assuage, *v. n.* to abate.

ASSUAGEMENT, *n. s.* mitigation; abatement of evil.

ASSUAGER, *n. s.* one who pacifies or appeaſes.

ASSUASIVE, *adj.* ſoftening; mitigating.

ASSUEFACTION, *n. s.* the ſtate of being accuſtomed.

ASSUETUDE, *n. s.* cuſtom; habit.

To ASSUME, *v. a.* 1. To take.—2. To take upon one's ſelf.—3. To arrogate; to claim or ſeize unjuſtly.—4. To ſuppoſe ſomething without proof.—5. To appropriate.

ASSUMER, *n. s.* an arrogant man.

ASSUMING, *part. adj.* arrogant; haughty.

ASSUMPSIT, *n. s.* a voluntary promiſe made by word, whereby a man taketh upon him to perform or pay any thing to another.

ASSUMPTION, *n. s.* 1. The act of taking any thing to one's ſelf.—2. The ſuppoſition, or act of ſuppoſing of any thing without farther proof.—3. The thing ſuppoſed; a poſtulate.

Assumption, a feſtival in the Romiſh church, in honour of the miraculous aſcent of the Virgin Mary into heaven.

Assumption, an iſland of North America, in the gulph of St. Laurence, at the mouth of the river. It is covered with trees. Long. 14. 20. E. Lat. 49. 30. N.

Assumption, a large and populous town of S. America, in Paraguay, ſeated on the river. It is a biſhop's ſee, and is ſeated in a country fertile in corn and fruits, whoſe trees are always green. There is likewiſe a quantity of paſture, and the air is temperate and ſalutary. Long. 17. 20. E. Lat. 34. 10. S.

ASSUMPTIVE, *adj.* that is aſſumed.

ASSURANCE, *n. s.* 1. Certain expectation.—2. Secure confidence; truſt.—3. Freedom from doubt; certain knowledge.—4. Firmneſs; undoubting ſteadineſs.—5. Confidence; want of modeſty.—6. Freedom from vicious ſhame.—7. Ground of confidence; ſecurity given.—8. Spirit; intrepidity.—9. Sanguineneſs; readineſs to hope.—10. Teſtimony of credit.—11. Conviction.—12. [In theology.] Security with reſpect to a future ſtate; certainty of acceptance with God.—13. The ſame with *inſurance.* See Insurance.

To ASSURE, *v. a.* 1. To give confidence by a firm promiſe.—2. To ſecure to another; to make firm.—3. To make confident; to exempt from doubt or fear; to confer ſecurity.—4. To make ſecure.—5. To affiance; to betroth.

ASSURED, *part. adj.* 1. Certain; indubitable; not doubted.—2. Certain; not doubting.—3. Immodeſt; viciouſly confident.

ASSUREDLY, *adv.* certainly; indubitably.

ASSUREDNESS, *n. s.* the ſtate of being aſſured; certainty.

ASSURER, *n. s.* 1. He who gives aſſurance.—2. He who gives ſecurity to make good any loſs.

ASSYRIA, an ancient kingdom of Aſia, concerning the extent, commencement, and duration of which, hiſtorians differ greatly in their accounts. The origin and revolution of the Aſſyrian monarchy were as follows.—The founder of it was Aſher, the ſecond ſon of Shem, who went out of Shinar, either by the appointment of Nimrod, or to elude the fury of that tyrant; conducted a large body of adventurers into Aſſyria, and laid the foundation of Ninevah. *Gen.* x. 11. Theſe events happened not long after Nimrod had eſtabliſhed the Chaldæan monarchy, and fixed his reſidence at Babylon. The Perſian hiſtorians ſuppoſe that the kings of Perſia of the firſt dynaſty were the ſame with the kings of Aſſyria, of whom Zohah, or Nimrod, was the founder of Babel. (*Herbelot Orient. Bibl.* v. *Bagdad.*) It does not, however, appear, that Nimrod reigned in Aſſyria. The kingdoms of Babylon and Aſſyria were originally diſtinct and ſeparate; (*Micah* v. 6.) and in this ſtate they remained until Ninus conquered Babylon, and made it tributary to the Aſſyrian empire. Ninus, the ſucceſſor of Aſhur, (*Gen.* x. 11. *Diod. Sic. lib.* 1.) ſeized on Chaldæa, after the death of Nimrod, and united the kingdoms of Aſſyria and Babylon. This prince is ſaid to have ſubdued Aſia, Perſia, Media, Egypt, &c. If he did ſo, the effects of his conqueſts were of no duration; for, in the days of Abraham, we do not find that any of the neighbouring kingdoms were ſubject to Aſſyria. He was ſucceeded by Semiramis; a princeſs of an heroic mind; bold, enterpriſing, fortunate; but of whom many fabulous things have been recorded. It appears, however, that there were two princeſſes of the ſame name, who flouriſhed at very different periods. One of them was the conſort of Ninus; and the other lived five generations before Nitocris queen of Nebuchadnezzar. (*Euseb. Chron. p.* 58. *Herod. lib.* i. *cap.* 184.) This fact has not been attended to by many writers. Whether there was an uninterrupted ſeries of kings from Ninus to Sardanapalus, or not, is ſtill a queſtion. Some ſuſpicion has ariſen, that the liſt which Cteſias has given of the Aſſyrian kings is not genuine; for many names in it are of Perſian, Egyptian, and Grecian extraction. Nothing memorable has been recorded concerning the ſucceſſors of Ninus and Semiramis. Of that effeminate race of princes it is barely ſaid, that they aſcended the throne, lived in indolence, and died in their palace at Nineveh. Diodorus relates, that, in the reign of Teutames, the Aſſyrians, ſolicited by Priam their vaſſal, ſent to the Trojans a ſupply of 20,000 foot and 200 chariots, under the command of Memnon, ſon of Tithonus, preſident of Perſia. But this is not confirmed by any other author. Sardanapalus was the laſt, and by all accounts the moſt effeminate, of theſe ancient Aſſyrian kings. Hiſtorians have unanimouſly reprobated his character. We by no means wiſh to defend it, but we cannot help remarking, that moſt of thoſe princes, upon whom they have beſtowed the epithet of *Great*, are much worſe characters than Sardanapalus. The indolent and effeminate prince, who devotes his whole time to his pleaſures, is at leaſt a *harmless animal*, compared with the ambitious monſter, who ſacrifices millions of his fellow mortals to his glory or his avarice. But leaving ſimilar remarks to the reader's philanthropy, we have only to add that Arbaces, governor of Media, taking advantage of Sardanapalus's indolence, withdrew his allegiance, and rebelled againſt him. He was encouraged in this revolt by the advice and aſſiſtance of Beleſis, a Chaldean prieſt, who engaged the Babylonians to follow the example of the Medes. Theſe powerful provinces, aided by the Perſians and other allies, who deſpiſed the effemenacy, or dreaded the tyranny of their Aſſyrian lords, attacked the empire on all ſides. Their moſt vigorous efforts were, in the beginning unſucceſsful. Firm and determined, however, in their oppoſition, they at length prevailed, defeated the Aſſyrian army, beſieged Sardanapalus in his capital, which they demoliſhed, and became maſters of the empire, A. A. C. 821. After the death of Sardanapalus, the Aſſyrian empire was divided into three kingdoms, viz. the Median, Aſſyrian, and Babylonian. Arbaces retained the ſupreme power and authority, and fixed his reſidence at Ecbatana in Media. He nominated governors in Aſſyria and Babylon, who were honoured with the title of *kings*, while they remained ſubject and tributary to the Median monarchs. Beleſis received the government of Babylon as the reward of his ſervices; and Phul was entruſted with that of Aſſyria. The Aſſyrian governor gradually enlarged the boundaries of his kingdom, and was ſucceeded by Tiglath-pileſer, Salmanaſar, and Senacherib, who aſſerted and maintained their independency. After the death of Eſar-haddon, the brother and ſucceſſor of Senacherib, the kingdom of Aſſyria was ſplit, and annexed to the kingdoms of Media and Babylon. Several tributary princes afterwards reigned in Nineveh; but no particular account of them is found in the annals of ancient nations. This ancient empire is now almoſt entirely ſubject, either to the Turks or Perſians; being divided into three provinces, now called CURDISTON, DIARBEC, the ancient Meſopotamia, and IRAK ARABIC, the ancient Chaldea. For farther particulars, reſpecting its modern ſtate, ſee theſe articles.

ASTERISK, *n. s.* a mark in printing or writing, in the form of a little ſtar; as *.

ASTERISM, *n. s.* 1. Conſtellation.—2. An aſteriſk, or mark.

ASTERN, *adv.* in the hinder part of the ſhip; behind the ſhip.

ASTERN is alſo uſed to ſignify any thing at ſome diſtance behind the ſhip; being the oppoſite of AHEAD, which ſignifies the ſpace before her. See AHEAD.

ASTHMA, *n. s.* a frequent, difficult, and ſhort reſpiration, joined with a hiſſing ſound and a cough, eſpecially in the night-time, and when the body is in a prone poſture; becauſe then the contents of the lower belly bear ſo againſt the diaphragm, as to leſſen the capacity of the breaſt, whereby the lungs have leſs room to move. See MEDICINE.

ASTHMATICAL, } *adj.* troubled with an aſthma.
ASTHMATIC, }

ASTONIED, *part. adj.* a word uſed in the verſion of the bible for *astonished*.

To ASTONISH, *v. a.* to confound with ſome ſudden paſſion, as with fear or wonder; to amaze; to ſurpriſe; to ſtun.

ASTONISHMENT, *n. s.* amazement; confuſion of mind from fear or wonder.

ASTRACAN, a province of Ruſſia, and the moſt eaſterly part of Europe; bounded on the N. by Bulgaria and Baſkiria; on the S. by the Caſpian Sea; on the W. by the Volga, which divides it from the Nagayan Tartars and Don Coſſacks; and on the E. by the great ridge of mountains which ſeparate it from Great Tartary. The province extends from 46. to 50. N. Lat. The ſummer is long, and intenſely hot: the winter continues about three months ſo ſevere, that the Volga is frozen hard enough to bare loaded ſledges. The ſoil is rich and fertile; but the Tartars who inhabit it are ſtrangers to agriculture. On the weſtern and ſouthern ſides of the Volga are heaths of a prodigious extent, ſandy, deſert, and uncultivated: theſe, however, produce vaſt quantities of fine tranſparent ſalt in pits, where the ſun bakes and incruſtates it to the thickneſs of an inch on the ſurface of the water. There are pits in the neighbourhood of Aſtracan which yield this excellent ſalt in ſuch abundance, that any perſon may carry it off, paying at the rate of one farthing a pooſt, which is equal to 40 ℔.

ASTRACAN, the metropolis of the above province, is ſituated within the boundaries of Aſia, on an iſland called *Dolgoi*, about 60 Engliſh miles above the mouth of the Volga. It is about two miles and a half in circumference, ſurrounded by a brick wall, in a ruinous condition; but including the ſuburbs, near five miles. The number of inhabitants amounts to 70,000, including Armenians, Tartars, and a few Perſians and Indians. The garriſon conſiſts of ſix regiments of the beſt Ruſſian troops, who, when this place was alarmed from the ſide of Perſia, had in the adjacent plain erected a great number of ſmall batteries, to ſcour the fields, and obſtruct the approach of the enemy. The houſes of Aſtracan are built of wood, and generally mean and inconvenient. The higher parts of the city command a proſpect of the Volga, which is here about three miles in breadth. The marſhy lands on the banks of it render the place very ſickly in ſummer. Aſtracan is a good ſea port, for the Perſian market.

Formerly the inhabitants of A
and Bokhara; but at preſent t
there commerce is limited to
Ruſſia. Even the trade to Pe

the troubles of that country: nevertheleſs, the commerce of Aſtracan is ſtill conſiderable. The merchants export to Perſia, chiefly on account of the Armenians, red leather, linens, woollen cloths, and other European manufactures. In return, they import the commodities of Perſia, particularly thoſe manufactured at Caſan; ſuch as ſilk ſaſhes intermixed with gold, for the uſe of the Poles; wrought ſilks and ſtuffs mixed with cotton; rice, cotton, rhubarb, and a ſmall quantity of other drugs; but the chief commodity is raw ſilk. The government has engroſſed the article of rhubarb, the greater part of which is brought into Ruſſia by the Tartars of Yakutſki, bordering on the eaſtern Tartars belonging to China.

The earth of this province being impregnated with ſalt, is extremely fertile, and produces abundance of fruit, the immoderate uſe of which is attended with epidemical diſtempers. Sickneſs is likewiſe the conſequence of thoſe annual changes in the atmoſphere produced by the floods in ſpring and autumn. All round the city of Aſtracan, at the diſtance of two miles, are ſeen a great number of gardens, orchards, and vineyards, producing all ſorts of herbs and roots. The grapes are ſo delicious, that they are preſerved in ſand, and tranſported to court by land-carriage at a prodigious expence: yet the wine of Aſtracan is very indifferent. About ten miles below the metropolis there is a ſmall iſland called **Bosmaife**, on which are built large ſtorehouſes for the ſalt, which is made about 12 miles to the eaſtward, and, being brought hither in boats, is conveyed up the Volga, in order to ſupply the country as far as Moſcow and Twere. The quantity of ſalt annually dug for theſe purpoſes amounts to ſome millions of pounds, the excluſive property of which is claimed by the crown, and yields a conſiderable revenue; for the ſoldiers and bulk of the people live almoſt entirely on bread and ſalt. The neighbourhood of theſe ſalt works is of great advantage to the fiſheries, which extend from hence to the Caſpian Sea, and reach S. E. as far as Yack, and even 100 miles above Zaritzen. The principal fiſh caught here are ſturgeon and belluga. Theſe, being ſalted, are put on board of veſſels, and ſent away in the ſpring, for the uſe of the whole empire, even as far as Peterſburg: but as fiſh may be kept freſh as long as it is frozen, the winter is no ſooner ſet in than they tranſport great quantities of it by land through all the provinces of Ruſſia. Of the roes of the fiſh called *belluga*, which are white, tranſparent, and of an agreeable flavour, the fiſhers here prepare the caviare, which is in ſo much eſteem all over Europe. The city of Aſtracan lies 80 miles N. of the Caſpian Sea, and 800 S. W. of Moſcow. Lat. 46. 22. N. Long. 125. 33 .E.

ASTRADDLE, *adv.* with one's legs acroſs any thing.

ASTRAGAL, *n. s.* a little round member, in the form of a ring or bracelet, ſerving as an ornament at the tops and bottoms of columns.

Astragal, in architecture, a little round moulding, which in the orders ſurrounds the top of the ſhaft or body of the column. It is alſo called the *talon* and *tondino*; it is [illegible] at the bottoms as well as the tops of columns, and [illegible] r occaſions: it properly repreſents a ring, on what- [illegible] of a column it is placed; and the original idea of [illegible] of a circle of iron put round the trunk of a tree, to [illegible] rt an edifice to prevent its ſplitting. The [illegible] t into beads and berries, and is uſed in the ornamented entablatures to ſeparate the ſeveral faces of the architrave. See **Architecture**.

ASTRAY, *adv.* out of the right way.

To ASTRICT, *v. a.* to contract by application, in oppoſition to *relax*.

ASTRICTION, *n. s.* the act or power of contracting the parts of the body, by applications.

ASTRICTIVE, *adj.* ſtyptick; of a binding quality.

ASTRICTORY, *adj.* aſtringent; apt to bind.

ASTRIDE, *adv.* with the legs open.

To ASTRINGE, *v. a.* to preſs by contraction: to make the parts draw together.

ASTRINGENCY, *n. s.* the power of contracting the parts of the body; oppoſed to the power of *relaxation*.

ASTRINGENT, *adj.* binding; contracting, oppoſed to *laxative*: it is uſed ſometimes of taſtes which ſeem to contract the mouth.

ASTRINGENTS, in the materia medica, ſubſtances diſtinguiſhed by a rough, auſtere taſte, and changing ſolutions of iron, eſpecially thoſe made in the vitriolic acid, into a dark purple or black colour; ſuch as galls, tormentil root, biſtort root, balauſtines, terra japanica, acacia, &c. See **Materia Medica**.

ASTROLABE, *n. s.* 1. An inſtrument chiefly uſed for taking the altitude of the pole, the ſun or ſtars, at ſea.—2. A ſtereographick projection of the circles of the ſphere upon the plain of ſome great circles.

Astrolabe, among the ancients, was the ſame as our armillary ſphere.

Astrolabe, among the moderns, is uſed for **planisphere**, or a ſtereographic projection of the ſphere, either upon the plane or the equator, the eye being ſuppoſed to be in the pole of the world; or upon the plane of the meridian, when the eye is ſuppoſed in the point of the interſection of the equinoctial and horizon.

ASTROLOGER, *n. s.* 1. One who ſuppoſing the influences of the ſtars to have a cauſal power, profeſſes to foretel or diſcover events depending on thoſe influences.—2. It was anciently uſed for one that underſtood or explained the motions of the planets, without including prediction.

ASTROLOGIAN, *n. s.* the ſame with *aſtrologer*.

ASTROLOGICALLY, *adv.* in an aſtrological manner.

ASTROLOGICAL, } *adj.* 1. Profeſſing aſtrology.—2.
ASTROLOGICK, } Relating to aſtrology.

To ASTROLOGIZE, *v. n.* to practice aſtrology.

ASTROLOGY, *n. s.* the practice of foretelling things by the knowledge of the ſtars.

Astrology, was long conſidered as a ſcience, by which future events could be foretold, from the aſpects and poſitions of the heavenly bodies. In the literal ſenſe of the term, aſtrology ſhould ſignify no more than the doctrine or ſcience of the ſtars; which was its original acceptation, and made the ancient aſtrology; though in courſe of time, an alteration has ariſen; that which the ancients called aſtrology, being afterwards termed **Astronomy**. Aſtrology may be divided into two branches, *natural* and *judicial*.

Astrology, judicial or judiciary, which is what we commonly call ſimple aſtrology, is that which pretends to foretel moral events; i. e. ſuch as have a dependence on the free will and agency of man; as if they were directed by the ſtars. This art, which owed its origin to the practices of knavery on credulity, is now univerſally exploded by the intelligent part of mankind. The profeſſors of this kind of aſtrology maintain, "That the heavens are one great volume or book, wherein God has written the hiſtory of the world; and in which every man may read his own fortune, and the tranſactions of his time. The art, they ſay, had its riſe from the ſame hands as aſtronomy itſelf. While the ancient Aſſyrians, whoſe ſerene unclouded ſky favoured their celeſtial obſervations, were intent on tracing the paths and periods of the heavenly bodies, they diſcovered a conſtant ſettled relation of analogy, between them and things below; and hence were led to conclude theſe to be the *Parcæ*, the deſtinies, ſo much talked of, which preſide at our births, and diſpoſe of our future fate. The laws therefore of this relation being aſcertained, by a ſeries of obſervations, and the ſhare each planet has therein; by knowing the preciſe time of any perſon's nativity, they were enabled, from their knowledge in aſtronomy, to erect a ſcheme or horoſcope of the ſituation of the planets, at that point of time; and hence, by conſidering their degrees of power and influence, and how each was either ſtrengthened or tempered by ſome other, to compute what muſt be the reſult thereof." Such are the arguments of the aſtrologers in favour of their ſcience. But the chief province, now remaining to the modern profeſſors, is the making of calendars or almanacs. Judicial aſtrology is commonly ſaid to have been invented in Chaldæ, and thence tranſmitted to the Egyptians, Greeks, and Romans; though ſome will have it of Egyptian origin, and aſcribe the invention to Ham. But it is to the Arabs we owe it. At Rome the people were ſo infatuated with it, that the aſtrologers, or, as they were then called, the MATHEMATICIANS, maintained their ground in ſpite of all the edicts of the emperors to expel them out of the city. See GENETHLIACI. The Bramins, who introduced and practiſed this art among the Indians, have hereby made themſelves the arbiters of good and evil hours, which gives them great authority; they are conſulted as oracles; and they have taken care never to ſell their anſwers but at good rates. The ſame ſuperſtition has prevailed in more modern ages and nations. The French hiſtorians remark, that in the time of queen Catharine de Medicis, aſtrology was ſo much in vogue, that the moſt inconſiderable thing was not to be done without conſulting the ſtars. And in the reign of Henry III. and IV. of France, the predictions of aſtrologers were the common theme of the court converſation. This predominant humour in that court was well rallied by Barclay, in his Argenis, on occaſion of an aſtrologer, who had undertaken to inſtruct king Henry in the event of a war then threatened by the faction of the Guiſes.

ASTROLOGY, NATURAL, comprehends the predicting of natural effects; as the changes of weather, winds, ſtorms, hurricanes, thunder, floods, earthquakes, &c. This art properly belongs to phyſiology, or natural philoſophy; and is only to be deduced *a poſteriori*, from phenomena and obſervations. For this ſpecies of aſtrology, Mr. Boyle makes an apology, in his Hiſtory of the Air.

ASTRONOMER, *n. s.* one who ſtudies the celeſtial motions, and the rules by which they are governed.

ASTRONOMICAL, ASTRONOMIC, *adj.* belonging to aſtronomy.

ASTRONOMICAL CALENDAR, an inſtrument engraved on copper plates, printed on paper, and paſted on a board, with a braſs ſlider carrying a hair: it ſhows by inſpection the ſun's meridian altitude, right aſcenſion, declination, riſing, ſetting, amplitude, &c. to a greater degree of exactneſs than the common globes.

ASTRONOMICAL PLACE of a ſtar or planet, is its longitude or place in the ecliptic, reckoned from the beginning of Aries *in conſequentia*, or according to the natural order of the ſigns.

ASTRONOMICAL SECTOR, a very uſeful mathematical inſtrument, made by the late ingenious Mr. Graham; a deſcription of which is given in the courſe of the article ASTRONOMY.

ASTRONOMICALS, a name uſed by ſome writers for ſexageſimal fractions; on account of their uſe in aſtronomical calculations.

ASTRONOMICALLY, *adv.* in an aſtronomical manner.

ASTRONOMY.

ASTRONOMY, *n. s.* a mixed mathematical ſcience, teaching the knowledge of the celeſtial bodies, their magnitudes, motions, diſtances, periods, eclipſes, and order.

SECT. I. HISTORY OF ASTRONOMY.

That Aſtronomy was ſtudied in the very firſt ages of the world is beyond a doubt, as it muſt have been a neceſſary reſearch to form ſome judgment of the lapſe of time; for without that there could be no way of communicating ideas of paſt events, much leſs any intelligible records made of them.

And this could only be done by duly obſerving the motions and revolutions of the ſun and moon, which the All-wiſe Creator has appointed as indexes for that purpoſe. From this it ſhould appear that even Adam was not deſtitute of ſome knowledge in aſtronomy; for, otherwiſe, how could an account of his age, at the birth of Seth, or the number of years that he lived, have been preſerved?

Beſides, it ſeems extremely probable, that he, whom the Almighty had made Lord over the creation, by placing every creature in ſubordination, and to whom he committed the naming of every thing, ſhould know ſomething of the nature of each, and their ſeveral cauſes.

Joſephus, however, writes that Seth or his nephews, firſt obſerved the order of the heavens, and the courſes of the ſtars; and ſuppoſes that longevity was beſtowed upon the antideluvians for the very purpoſe of improving the ſciences of geometry and aſtronomy: adding, that the latter could not be learned in leſs than 600 years, the extremity of that period being the grand year. It is ſuppoſed Joſephus

mean:

meant the period in which the ſun and moon came again into the ſame ſituation, with regard to the moon's nodes, apogee, &c. as at the beginning.

If this was a fixed period of the antideluvians, they muſt have known more of aſtronomy than was known many ages after the flood.

Among the nations who firſt made any conſiderable figure in hiſtory, the Chaldeans and Egyptians were the moſt remarkable for their aſtronomical knowledge. They diſputed with each other the honour of having been the firſt cultivators of aſtronomy. The Chaldeans boaſted of their temple of Belus, and of Zoroaſter, who, as they pretended, flouriſhed 5000 years before the deſtruction of Troy; though, it is pretty certain, that he lived within a thouſand years of that event. The Egyptians, on the other hand, exulted in their ancient colleges of prieſts, where aſtronomy was taught, and of the monument of Oſymandyas; in which it is ſaid, there was a golden circle of 365 cubits in circumference, and one cubit thick. It is recorded that the upper face was divided into 365 equal parts, correſponding to the days in a year; and that on each diviſion was written the name of the day, the heliacal riſing of the ſeveral ſtars for ſuch days, with prognoſtications, &c.

It is further ſaid, that the Babylonians had obſervations for 700 years engraven upon bricks; and that when Alexander took Babylon, he carried away obſervations for almoſt 2000 years; but as they fell into the hands of ignorant and careleſs people, the greateſt part of them were loſt; which is ſuch a period of time, and fund of obſervations, as we have not to ſhew at this day. So arts and ſciences, as well as the ſtars, have their periods, ſtations, and retrogradations.

However, according to the beſt accounts, the Chaldeans derived the chief of their knowledge in aſtronomy from the Egyptians, who fled to Babylon, when Egypt was invaded by the Ethiopians.

The riſe of aſtronomy among the Greeks is unknown; though many are of opinion that they, as well as the Phœnicians, derived their knowledge in this ſcience from the Egyptians.

After aſtronomy was carried in Greece, Thales, the Mileſian, went thither for inſtruction. He flouriſhed about 580 years before Chriſt, and delighting himſelf in the ſcience, made conſiderable improvements. He is ſaid to have obſerved the exact time of the ſolſtices, and equinoctial points, to have taught the obliquity of the ecliptic, and to have been the firſt who foretold eclipſes.

He predicted a total eclipſe of the ſun, which happened on the 28th of May, 585 years before Chriſt, and alſo another of the moon.

After him, Thales, Anaximander, Anaximanes, Anaxagoras, and Pythagoras, contributed conſiderably to the advancement of aſtronomy. Pythagoras made great improvements both in aſtronomy and geometry, and deſcribed the order of the univerſe, agreeably to the preſent Newtonian ſyſtem.

Then followed Philolaus, Hicetas, Meton, Euctemon, Plato, Ariſtotle, Eudoxus, Calippus, &c. all of whom were men of conſiderable renown, and aſſiduous in promoting the progreſs of this and other ſciences; though Plato and Ariſtotle, inſtead of advancing, rather clouded aſtronomy, by embracing an erroneous ſyſtem, which was afterwards rigidly taught by Ptolemy, and from thence it was called the Ptolemaic ſyſtem.

Ariſtarchus, who lived about 270 years before Chriſt, diligently ſtrove to reſcue aſtronomy from the obſcurity into which it was brought by Plato and Ariſtotle, ſtrenuouſly aſſerting and defending the Pythagorean ſyſtem.

He gave a method of determining the diſtance of the ſun, by the moon's dichotomy.

The celebrated Archimedes, about 220 years before Chriſt, was no leſs ſkilful in aſtronomy than geometry. He invented a planetarium, or orrery, for repreſenting the phænomena and motions of the heavenly bodies; he alſo determined the diſtance of the moon from the earth, of Mercury from the moon, of Venus from Mercury, of the ſun from Venus, of Mars from the ſun, of Jupiter from Mars, and of Saturn from Jupiter; as likewiſe the diſtance of the fixed ſtars from the orbit of Saturn.

Hipparchus, who flouriſhed about 140 years before Chriſt, was a diligent obſerver of the ſtars. He was the firſt who diſcovered the orbits of the moon and planets to be eccentric, and the anticipation of the moon's nodes. He alſo determined the length of the year with great accuracy; conſtructed tables of the motions of the ſun and moon; and gave a catalogue of the latitudes, longitudes, and apparent magnitudes of 1022 ſtars.

In ſhort, he is reputed to have been the firſt who applied his ſtudy to every part of aſtronomy; and ſo indefatigable was he in his purſuits, that he is ſaid to have calculated all the eclipſes that were to happen for the ſpace of 600 years after him.

From the time of Hipparchus to that of Ptolemy, who flouriſhed about A. D. 70, aſtronomy made but little progreſs, and then it became enveloped in miſt and obſcurity, through Ptolemy's reviving the erroneous notions of Plato and Ariſtotle, as was before obſerved.

From this period, till the 16th century, the Pythagorean ſyſtem was entirely laid aſide; when it was reſtored again by Nicholas Copernicus, who wrote a treatiſe, dedicated to Pope Paul III. in the preface of which he attempted to apologize as much as poſſible for the extraordinary doctrines it appeared to contain. He died, however, within a few hours of its publication. But although, from the time of Ptolemy to that of Copernicus, the true ſyſtem was exploded, yet there were ſome who in other reſpects improved the ſcience.

Among the Arabians, the Caliph Al Mamun, who aſcended the throne in A. D. 814, was a great encourager of the ſciences. He made many aſtronomical obſervations himſelf, and determined the obliquity of the eccliptic to be 23° 35′. Alſo Albategnius, about A. D. 880, greatly reformed aſtronomy, he determined the preceſſion of the equinoxes to be 1 degree in 70 years, and, with Al Mamun, fixed the ſun's greateſt declination, at 23° 35′.

Uleg Beg, grandſon of the famous Tamerlane, was a great proficient in practical aſtronomy. He compoſed aſtronomical tables from his own obſervations, ſo exact as to differ very little from thoſe afterwards conſtructed by Tycho Brache. He alſo gave a catalogue of the fixed ſtars, made from his own obſervations in A. D. 1437; and determined the latitude of Samarcand, his capital, to be 39° 37′ 23″.

This ſhews how accurate he was in his obſervations. Likewiſe, previous to the time of Copernicus, John De Sacro Boſco (an Engliſhman) Purbach, John Muller of Monteregio, in Franconia, generally named Regiomontanus, and John Werner, a clergyman at Nuremberg, were great ſtudents in aſtronomy. The laſt of whom determined the preceſſion of the equinoctial points to be 1 degree and 10 minutes in 100 years; and the obliquity of the ecliptic to be 23° 23′, which numbers nearly agree with modern obſervations.

After the death of Copernicus, which was on the 33d of May, 1543, aſtronomy was much improved by Schoner, Nonius, Apian, and Gemma Friſius, though Schoner only ſurvived Copernicus four years. Gemma Friſius was the firſt who propoſed a time-keeper for aſcertaining the longitude at ſea.

About A. D. 1561, William the IVth, Landgrave of Heſſe Caſſel, applied himſelf to the ſtudy of this ſcience, and erected an obſervatory on the top of his palace, and afterwards gave a catalogue of the latitudes and longitudes of 400 ſtars from his own obſervations.

Tycho Brache was cotemporary with the Landgrave of Heſſe before mentioned; he made a vaſt number of obſervations, and publiſhed a catalogue of 770 ſtars.

He invented a new ſyſtem of the world, which he vainly endeavoured to eſtabliſh on the ruins of that of Copernicus; but the conſonancy and ſimplicity of the Copernican ſyſtem ſoon prevailed over the unnatural and complicated ſyſtem of Tycho.

But, notwithſtanding his old notion of the univerſe, his works diſcover him to have been a man of vaſt abilities.

The famous John Kepler, was for ſome time under the tuition of Tycho Brache; but he ſoon diſcovered the error of Tycho's Syſtem, and alſo found that his predeceſſors had been wrong in ſuppoſing the orbits of the planets to be circular; for, from his own obſervations he found them to be eliptical, and the Sun to be placed in one of the foci; he alſo diſcovered that all the planets deſcribe equal areas in equal times, and that the ſquares of the periodical times round the ſun are as the cubes of their mean diſtances.

He likewiſe diſcovered ſomething of the principle of gravity: for he ſignified that gravity is a mutual power betwixt two bodies; that the moon and earth tend towards each other, and would meet in a point nearer to the earth than the moon in the proportion of the ſuperior magnitude of the former; provided they were not hindered by their projectile motions. He further added, that the tides ariſe from the gravitation of the waters towards the moon.

But though Kepler, from the obſervations he made, went thus far, yet the true theory of the planetary motions, as reſulting from the principles of mechanics, and the doctrine of centripetal forces, he was an utter ſtranger to; and therefore it is not to be wondered at that he afterwards did not ſteadily adhere to theſe principles, but in lieu thereof ſubſtituted others as the cauſes of the planetary motions.

The buſineſs of adjuſting and demonſtrating theſe matters; of determining the true figures of the planets' orbits, and ſhewing that the irregular motions of the Satellites, &c. are perfectly conformable to the laws of motion and gravity, was reſerved for the immortal Engliſh philoſopher Sir Iſaac Newton, to whom aſtronomy, philoſophy, and the various branches of the mathematical ſciences, are indebted for almoſt every thing that is truly valuable.

Galileus, an Italian, in the beginning of the 17th century, by the help of teleſcopes, diſcovered the Satellites of Jupiter, and Saturn, the ring of Saturn, &c.

In 1663, Mr. Jeremiah Horrox foretold a tranſit of Venus that would happen on November 24th, 1639; he alſo formed a new theory of the moon, ſo ingenious as to attract the notice of Sir Iſaac Newton; but the hopes of Aſtronomers, from the abilities of this excellent young man, were diſappointed, by his death in January 1640, he being then only about 22 years of age.

Mr. John Flamſtead, the firſt Aſtronomer Royal in Great Britain, made many obſervations on the Sun, Moon, Planets, and Comets; and on the ſtars alſo; publiſhing a catalogue of 3000. He likewiſe publiſhed new ſolar tables, and a theory of the moon, according to Horrox; and it was from his obſervations that Dr. Halley's tables and Sir Iſaac Newton's theory of the moon were conſtructed.

Mr. Flamſtead died A. D. 1719, and was ſucceeded by Dr. Halley, a moſt excellent Aſtronomer and Mathematician, as appears clearly by his writings in the Philoſophical Tranſactions. He was the firſt who diſcovered the acceleration of the Moon; and gave a very ingenious method of finding her parallax by three obſerved phaſes of a Solar Eclipſe. He compoſed a complete ſet of tables of the ſun, moon, and all the planets, except the Georgium Sidus, ſince diſcovered; and, in the courſe of nine years ſpent at the Obſervatory, he made near 1500 obſervations of the moon.

Dr. Halley dying, A. D. 1742, was ſucceeded by Dr. Bradley, who was a moſt accurate obſerver, and who diſcovered the aberration of light, and the mutation of the earth's axis. He alſo obſerved the places and computed the elements of the comets which appeared in the years 1723, 1736, 1743, 1757.

He made new and accurate tables of Jupiter's Satellites, and accompliſhed various other improvements in aſtronomy too tedious to mention.

Dr. Bradley died A. D. 1762, and was ſucceeded by Mr. Bliſs, Savilian Profeſſor of Aſtronomy at Oxford, who died ſoon after, and was ſucceeded by Nevile Maſkeline, D. D. the preſent Aſtronomer Royal.

The moſt remarkable foreign Aſtronomers ſince Mr. Flamſtead's times are M. de la Caille, Clairault, Euler, Ferguſon, Mayer, Wargentine, and M. de la Lande, all of whom have ſhewn great genius and induſtry in improving aſtronomical tables.

M. De la Lande's planetary tables, Mayer's lunar tables, as improved by Maſon, and Wargentine's tables of the Satellites are ſuppoſed the moſt correct, and are uſed by Dr. Maſkeline, the preſent Aſtronomer Royal, in calculating the Nautical Ephemeris for the uſe of the navy.

But, perhaps, the greateſt aſtronomer that appeared in the laſt century, was the late Dr. Herſchel, who, through his wonderful improvement of teleſcopes, has explored the celeſtial regions far beyond whatever had been done; and has diſcovered the new planet Georgium Sidus, and an immenſe number of ſtars that were totally unknown before. By his diſcoveries among the fixed ſtars he has greatly enlarged our ideas of the univerſe; and had he lived, there was reaſon to have hoped, that he might have perfected all that the Great Newton left unfiniſhed.

It would be unpardonable to cloſe this ſketch, without taking notice of our American aſtronomer, the late David Rittenhouſe, Eſq. of Pennſylvania, who appears to have devoted himſelf to this ſort of ſtudy from his younger years, and made ſuch progreſs as reflects honour on his memory. At the age of 20 years, he made a reflecting teleſcope of 8 inches focal diſtance, on the Newtonian conſtruction, and in the year 1769, executed his orrery, or planetarium, which, at that time, exhibited a more correct view of the motions of the heavenly bodies, than any thing which had hitherto been deviſed.

PART I.

OF THE APPEARANCES OF THE CELESTIAL BODIES.

SECT. I. *Of the* CELESTIAL BODIES, *as seen by the* NAKED EYE.

The moſt obvious celeſtial phenomenon is the daily riſing of the SUN in the eaſt, and his ſetting in the weſt; next to which is that of the MOON and STARS appearing, and keeping the ſame weſterly courſe. Theſe cannot be long taken notice of before we muſt perceive that neither the ſun nor moon always riſes exactly in the ſame point of the heavens. If we obſerve the ſun, from the beginning of March, we find that he ſeems to riſe almoſt every day ſenſibly more to the northward, than he did the day before, to continue longer above the horizon, and to be more elevated at mid-day, till towards the end of June, when he is obſerved to move backward in the ſame manner: this retrograde motion continues beyond the middle of December, when he begins again to move forwards, and ſo on.

When the *New* MOON (as ſhe is called, at her early period,) firſt becomes viſible, ſhe appears in the weſtern part of the heavens, at no great diſtance from the ſun. Every night ſhe increaſes in ſize, and removes to a greater diſtance from the ſun; till at laſt ſhe appears in the eaſtern part of the horizon, juſt at the time the ſun diſappears in the weſtern. After this ſhe gradually moves farther and farther eaſtward, riſing every night later and later, till at laſt ſhe ſeems to approach the ſun as nearly in the eaſt as ſhe did in the weſt, and riſes only a little before him in the morning, as in the firſt part of her courſe ſhe ſet in the weſt not long after him. All theſe different appearances are completed in the ſpace of a month; after which they begin in the ſame order as before.

Several of the ſtars neither riſe in the E. nor ſet in the W. but ſeem to turn round an immoveable point, near which is placed a ſingle ſtar called the POLE, or POLE STAR. This point is more or leſs elevated according to the different parts of the earth from which we take our view. The inhabitants of Lapland, for inſtance, ſee it much more elevated than we do; we ſee it more elevated than the inhabitants of France and Spain; and they, again, ſee it more elevated than the inhabitants of Barbary. By continually travelling ſouth, this ſtar at laſt ſeems depreſſed in the horizon, and another point appears directly oppoſite to it, round which the ſtars in the ſouthern part of the horizon ſeem to turn. In this part of the heavens, however, there is no ſtar ſo near the pole as there is in the northern part; nor is the number of ſtars in the ſouthern part of the heavens ſo great as the northern part.

Suppoſing us ſtill to travel ſouthward, the north pole entirely diſappears, and the whole hemiſphere appears to turn round a ſingle point in the ſouth, as the northern hemiſphere appears to us to turn round the pole ſtar. The general appearance of the heavens, therefore, is that of a vaſt concave ſphere, turning round two points fixed in the north and ſouth parts of it, once in 24 hours.

The majority of the ſtars keep their places with reſpect to one another; that is, if we obſerve two ſtars having a certain apparent diſtance from each other one night, they ſeem to have the ſame every ſucceeding night. But all the ſtars in the heavens do not appear to be of this fixed kind: ſome of them change their places, with regard to the fixed ſtars, and to one another. Of theſe, five were only obſerved formerly; but Herſchel has now diſcovered a ſixth. They are diſtinguiſhed by the appellation of PLANETS, and called by the names of *Mercury*, *Venus*, *Mars*, *Jupiter*, *Saturn*, and *Herschel*. or the *Georgium Sidus*. The fixed ſtars are likewiſe diſtinguiſhed from the planets by continually exhibiting that appearance which is called the *scintillation* or *twinkling of the stars*.

MERCURY is a ſmall ſtar, which emits a very bright white light; but by always keeping near the ſun, he is ſeldom to be ſeen, except for a ſhort time, a little after ſunſet, and again a little before ſunriſe.

VENUS, the moſt beautiful ſtar in the heavens, known by the names of the *morning* and *evening star*, keeps near the ſun, though at almoſt double the diſtance of Mercury.

MARS is of a red fiery colour, and gives a much duller light than Venus, though ſometimes he equals her in ſize. He is not ſubject to the ſame limitation in his motions as Mercury or Venus; but appears ſometimes very near the ſun, and ſometimes at a great diſtance from him: ſometimes riſing when the ſun ſets, or ſetting when he riſes.

JUPITER and SATURN often appear at great diſtances from the ſun. The former ſhines with a bright white light, and the latter with a pale faint one; and the motion of Saturn among the fixed ſtars is ſo ſlow, that, unleſs carefully obſerved, he will not be thought to move at all. HERSCHEL's motion is ſtill ſlower, and he is ſeldom to be ſeen without a teleſcope.

The apparent magnitudes of theſe bodies are very different at different times. Every perſon muſt have obſerved that Venus is not always equally big; and this apparent difference of magnitude is ſo remarkable, that ſhe appears no leſs than 32 times larger at ſome ſeaſons than at others. This increaſe of magnitude is likewiſe very remarkable in Mars and Jupiter, but leſs ſo in Saturn, Mercury, and Herſchel. Theſe planets by no means appear to us to move regularly in the heavens, but, on the contrary, ſometimes go forward, ſometimes backward, and ſometimes ſeem to be ſtationary.

There are other moving bodies, beſides the planets, which appear at uncertain intervals, and with a very different aſpect. Theſe are very numerous, and no fewer than 450 are ſuppoſed to belong to our ſolar ſyſtem. They are called COMETS, having generally a long tail, ſomewhat reſembling the appearance of hair; which, as it diffuſes a luminous matter around them, exhibits an appearance very much reſembling the Aurora Borealis. They appear to come in a direct line towards the ſun, and after having diſappeared for ſome time in conſequence of their proximity to that luminary, fly off again on the other ſide as faſt as they came, projecting a tail much greater and brighter in their receſs; but, getting daily at a farther diſtance from us in the heavens, they continually loſe ſome of their ſplendour, and at laſt totally diſappear.

The apparent magnitude of comets is very different; ſometimes they appear only of the bigneſs of the fixed ſtars; at other times they equal the diameter of Venus, and ſometimes even of the ſun or moon.

The FIXED STARS are liable to changes: ſeveral obſerved by the ancients are now no more to be ſeen; and new ones have appeared, which were unknown to the ancients. Some of them have alſo diſappeared for ſome time, and again become viſible. At times ſome have been obſerved to diſtinguiſh themſelves by ſuperlative luſtre; but afterwards decreaſing, to vaniſh by degrees, and to be no more ſeen. One of theſe ſtars being firſt ſeen and obſerved by Hipparchus, ſet him upon compoſing a catalogue of the fixed ſtars, that by it poſterity might learn whether any of the ſtars periſh, and others are produced afreſh. After ſeveral ages, Tycho Brache obſerved another new ſtar which put him on the ſame deſign. Of theſe changes accounts have been given by Halley, and Montanere and Pigot in the Philoſoplical Tranſactions.

The GALAXY or MILKY WAY, is a remarkable appearance in the heavens, being a broad ring of a whitiſh colour, ſurrounding the whole celeſtial concave, whoſe light is now known to proceed from vaſt cluſters of ſtars, diſcoverable only by the teleſcope. Mr. Brydone, in his journey to the top of Mount Ætna, found this phenomenon to make a glorious appearance, "like a pure flame, (as he expreſſes it) that ſhot acroſs the heavens."

The only other appearances, which are very obſervable by the unaſſiſted eye, are thoſe obſcurations of the ſun and moon, commonly called ECLIPSES. Theſe are too well known, and attract the attention too much, to need any particular deſcription. We have, however, accounts very well authenticated, of obſcurations of the ſun continuing for a much longer time than a common eclipſe poſſibly can do, and likewiſe of the darkneſs being much greater than uſual on ſuch occaſions.

SECT. II. *Of the* CELESTIAL BODIES *as seen through* TELESCOPES.

Although the ſun, to the naked eye, is extremely bright and ſplendid, he is frequently obſerved, even through a teleſcope of but very ſmall powers, to have dark ſpots on his ſurface, which are ſaid to have been diſcovered in 1611; and the honour of the diſcovery is diſputed betwixt Galileo and Scheiner, a German Jeſuit at Ingolſtadt.

There is great variety in the magnitudes of theſe ſpots; the difference is chiefly in ſuperficial extent of length and breadth; their depth or thickneſs is very ſmall: ſome have been ſo large, as by computation to be capable of covering the continents of Aſia and Africa; nay, the whole ſurface of the earth, or even five times its ſurface. The diameter of a ſpot, when near the middle of the diſk, is meaſured by comparing the time it takes in paſſing over a croſs hair in a teleſcope, with the time wherein the whole diſk of the ſun paſſes over the ſame hair; it may alſo be meaſured by the micrometer; and, by either of theſe methods, we may judge how many times the diameter of the ſpot is contained in the diameter of the ſun.

Spots are ſubject to increaſe and diminution of magnitude, and ſeldom continue long in the ſame ſtate. They are of various ſhapes; moſt of them having a deep black nucleus ſurrounded by a duſky cloud, whereof the inner parts near the black are a little brighter than the outſkirts. They change their ſhapes, ſomething in the manner that our clouds do; though not often ſo ſuddenly: thus what is of a certain figure to-day, ſhall, to-morrow, or perhaps in a few hours, be of a different one; what is now but one ſpot, ſhall, in a little time be broken into two or three, and ſometimes two or three ſpots ſhall coaleſce, and be united into one. The number of ſpots on the ſun is very uncertain; ſometimes there are a great many, ſometimes very few; and ſometimes none at all.

It is evident from the various appearances that the ſpots are not endowed with any permanency, nor at all regular in their ſhape, magnitude, number, or time of appearance or continuance. Hevelius obſerved one that aroſe and vaniſhed in 16 or 17 hours; and no one has been obſerved to continue longer than 70 days: thoſe ſpots that are formed gradually, are gradually diſſolved; while thoſe that ariſe ſuddenly, are for the moſt part ſuddenly diſſolved. When a ſpot diſappears, that part where it was generally becomes brighter than the reſt of the ſun, and continues ſo for ſeveral days; on the other hand, thoſe bright parts called *faculæ* (as the others are called *maculæ*) ſometimes turn to ſpots.

The face of the ſun, when clear of ſpots, ſeen by the naked eye through a ſmoked or coloured glaſs, or through a thin cloud, or the vapours near the horizon, appears all over equally luminous: but when viewed through the teleſcope, the glaſſes being ſmoked or coloured, the middle of the diſk appears brighter than the outſkirts; becauſe the light is darted more directly towards us from the middle than from any other part, and the faculæ appear more diſtinctly near the ſides, as being on a darker ground than in the middle.

The ſpots are not confined to one part of the ſun's diſk; though we have not heard of any being obſerved about his polar regions. The paths they deſcribe in their courſe over the diſk are exceedingly different; ſometimes being ſtraight lines, ſometimes curves, ſometimes deſcending from the northern to the ſouthern part of the diſk, ſometimes aſcending from the ſouthern to the northern, &c. Beſides theſe ſpots, there are others which ſometimes appear very round and black, travelling over the diſk of the ſun in a few hours, totally unlike the others, and proceeding from an interpoſition of the planets Mercury and Venus between the earth and the ſun. Excepting the two kinds of ſpots above mentioned, however, no kind of object is diſcoverable on the ſurface of the ſun, but he appears like an immenſe ocean of elementary fire or light.

The appearance of the MOON is very different. Many darkiſh ſpots appear in her to the naked eye; and through a teleſcope their number is prodigiouſly increaſed: ſhe alſo appears very plainly to be more protuberant in the middle than at the edges, or to have the figure of a globe, and not a flat circle. When the moon is gibbous or horned, the one ſide appears very ragged and uneven, but the other always exactly defined and circular. The ſpots in the moon always keep their places exactly; never vaniſhing, or going from one ſide to the other, as thoſe of the ſun do. We ſometimes ſee more or leſs of the northern and ſouthern, and eaſtern and weſtern part of the diſk or face; which is owing to what is called the libration.

Mercury, when looked at through teleſcopes magnifying about 200 or 300 times, appears equally luminous throughout his whole ſurface, without the leaſt dark ſpot. He appears to have the ſame phaſes with the moon, being ſometimes horned, ſometimes gibbous, and ſometimes ſhining almoſt with a round face, though not entirely full, becauſe his enlightened ſide is never turned directly towards us; but at all times perfectly well defined without any ragged edge, and perfectly bright.

Venus, when viewed through a teleſcope, is rarely ſeen to ſhine with a full face, but has phaſes and changes like thoſe of the moon, by increaſing, decreaſing, being horned, gibbous, &c. Her illuminated part is conſtantly turned toward the ſun; being directed toward the eaſt when ſhe is a morning ſtar, and toward the weſt when an evening ſtar. Her different phaſes were firſt diſcovered by Galileo. Dr. Herſchel has publiſhed in the Phil. Tranſ. for 1793, a long ſeries of obſervations on this planet, from which he concludes; 1. that the planet revolves about its axis, but that the period, and the poſition of the axis are uncertain; 2. that the planet's atmoſphere is very conſiderable; 3. that there are probably hills and inequalities upon its ſurface, though he has not been able to ſee much of them, owing, perhaps to the denſity of its atmoſphere; and, 4. that this planet is ſomewhat larger than the earth, inſtead of being leſs, as former aſtronomers have imagined.

Much larger and more remarkable ſpots have been perceived on the diſk of **Mars**, than on that of any other primary planet. By very accurate obſervations Herſchel has determined the proportion between the polar and equatorial diameters, and the length of the day in this planet. He has alſo given ſome good conjectures on its ſeaſons and its atmoſphere: the latter it is now aſcertained to have; but though conſiderable, the atmoſphere is not of ſo great an extent as the conjectures on former obſervations led aſtronomers to imagine.

Jupiter has the ſame general appearance with Mars, only that the belts on his ſurface are much larger and more permanent. Their number is very variable, as ſometimes only one, and at other times no fewer than 8, may be perceived. They are generally parallel to one another, but not always ſo; and their breadth is likewiſe variable, one belt having been obſerved to grow narrow, while another in its neighbourhood has increaſed in breadth, as if the one had flowed into the other. The time of their continuance is very uncertain, ſometimes remaining unchanged for three months; at others, new belts have been formed in an hour or two. In ſome of theſe belts large black ſpots have appeared, which moved ſwiftly over the diſk from eaſt to weſt, and returned in a ſhort time to the ſame place; from whence the rotation of this planet about its axis has been determined.

The figure of Jupiter is evidently an oblate ſpheroid, the longeſt diameter of his diſk being to the ſhorteſt as 13 to 12. His rotation is from weſt to eaſt, like that of the ſun, and the plane of his equator is very nearly coincident with that of his orbit; ſo that there can ſcarce be any difference of ſeaſons in that planet. His rotation has been obſerved to be ſomewhat quicker in his aphelion than his perihelion.

The moſt remarkable circumſtance attending this planet is his having **four moons** or **satellites**, which conſtantly revolve round him at different diſtances. Theſe are all ſuppoſed to move in ellipſes; though the eccentricities of all of them are too ſmall to be meaſured, excepting that of the fourth; and even this amounts to no more than 0.007 of its mean diſtance from the primary.

The periodic times and diſtances of theſe ſatellites, in ſemidiameters of Jupiter, as well as in Engliſh miles, the angles under which their orbits appear, as ſeen from the earth, at its mean diſtance from Jupiter, taken from the lateſt and moſt exact obſervations, are as follows:

No	Periodic times.				Diſtances in		Angles of Orb.	
					Semi-diam.	miles.		
1	1*d*.	18*h*.	27′	34″	$5\frac{2}{3}$	266,000	3′	55
2	3	13	13	42	$9\frac{1}{16}$	423,000	6	14″
3	7	3	42	36	$14\frac{5}{1}$	676,000	9	58
4	16	16	32	9	25 [illegible]	1,189,000	17	30

Saturn, when viewed through a good teleſcope, makes a more remarkable appearance than any of the other planets. Galileo firſt diſcovered his uncommon ſhape, and from the diſcoveries made by him and other aſtronomers, it appears that this planet is ſurrounded by a broad thin ring, the edge of which reflects little or none of the ſun's light to us, but the planes of the ring reflect the light in the ſame manner that the planet itſelf does; and if we ſuppoſe the diameter of Saturn to be divided into 3 equal parts, the diameter of the ring is about 7 of theſe parts. The ring is detached from the body of Saturn in ſuch a manner, that the diſtance between the innermoſt part of the ring and the body is equal to its breadth.

Dr. Herſchel has found that the ring is double or that there are two concentric rings; alſo that it has a motion of rotation in its own plane, its axis of motion being the ſame as that of Saturn himſelf, and its periodical time 10*h* 32′ 15,″ 4: But he thinks it probable that the concentric rings may not revolve in the ſame period. Their dimenſions, and the ſpace between them he ſtates in the following proportion to each other:

	miles.
Inner diameter of the ſmaller Ring	146345
Outſide diam. of do.	184393
Inner diam. of the larger Ring	190248
Outſide diam. of do.	204883
Breadth of the inner Ring	20000
Breadth of the outer do.	7200
Breadth of the vacant ſpace	2839

Dr. Herſchel concludes, from his obſervations on the Ring, that its ſtructure is ſuch, as to allow it to remain permanently in its preſent ſtate; nor does he think it at all probable that the ring is of that changeable nature which ſome perſons have imagined.

The ſame excellent aſtronomer from a ſeries of obſervations on the belts of Saturn has concluded that he revolves upon his axis in 10*h* 16′ 0,″ 4, that he has a denſe atmoſphere, and that his polar diameter is to his equatorial one as 10 to 11.

Saturn has beſides his ring, ſeven little ſecondary planets or ſatellites revolving round him. One of them, which till lately was reckoned the 4th in order from Saturn, was diſcovered by Huygens in 1655 by means of a teleſcope 100 feet long; and the others, viz. the 1ſt, 2d, 3d, and 5th, at different times by Caſſini, between 1671 and 1684, by the help of glaſſes of 100 and 136 feet. The 6th and 7th have lately been diſcovered by Herſchel with his 40 feet reflecting teleſcope in 1787 and 1788. Theſe he has called the 6th and 7th ſatellites, though they are nearer to Saturn than the other 5; that the names may not be miſtaken with regard to former obſervations of them.

The periodical revolutions and diſtances of theſe ſatellites expreſſed in ſemidiameters of that planet, and in Engliſh miles are as follow:

No.	Periodical time.				Diſtances in		Angles of Orbs.	
					Semi-diam	Miles.		
1	1*d*	21*h*	13′	27″	$4\frac{3}{8}$	170,000	1′	27″
2	2	17	41	22	$5\frac{1}{2}$	217,000	1	52
3	4	12	25	12	8	303,000	2	36
4	15	22	41	13	18	704,000	6	18
5	72	7	48	0	54	2,050,000	17	4
6	1	8	53	9	$3\frac{5}{9}$	135,000	1	14
7	0	22	40	46	$2\frac{5}{5}$	107,000	0	57

The four firſt deſcribe ellipſes like thoſe of the ring and are in the ſame plane: their inclination to the orbit is from 30 to 31°. The 5th deſcribes an orbit inclined from 17° to 18° to the orbit of Saturn, his plane lying between the ecliptic and thoſe of the other ſatellites. Dr. Herſchel obſerves that the 5th ſatellite turns round its axis once, exactly in the time in which it revolves round the planet Saturn. In this reſpect it reſembles our moon, which does the ſame thing.

The GEORGIUM SIDUS or HERSCHEL, being more remote than Saturn, is alſo leſs known. Its apparent magnitude is ſo ſmall, that it can ſeldom be ſeen by the naked eye, and even when viewed by means of the teleſcope, it appears only a few ſeconds in diameter. This planet was diſcovered by Dr. Herſchel in 1781; and in 1787 he likewiſe diſcovered two ſatellites that revolve round it. They are probably not leſs than Jupiter's moons, and their orbits are nearly perpendicular to the ecliptic. This is a circumſtance in which they differ from the attendants of all the other planets.

Their periods of revolution and angular diſtances from their primary are as follow:

Satellite.	Periods.				Diſt.	
1*st.*	8*d.*	17*h.*	1′	19″	0′	33″
2*d.*	13	11	5	$1\frac{1}{2}$	0	$44\frac{2}{9}$

The COMETS, viewed through a teleſcope, have a very different appearance from any of the planets. The nucleus, or ſtar, ſeems much dimmer. They are to appearance ſurrounded with atmoſpheres of a prodigious ſize, often riſing ten times higher than the nucleus, and have often likewiſe different phaſes, like the moon.

The head of a comet, ſeen through a good teleſcope, appears to conſiſt of a ſolid globe, and an atmoſphere that ſurrounds it. The ſolid part is frequently called the *nucleus*; which, through a teleſcope, is eaſily diſtinguiſhed from the atmoſphere of hairy appearance.

A comet is generally attended with a *blaze* or *tail*, whereby it is diſtinguiſhed from a ſtar or planet; as it is alſo by its motion. Sometimes the tail only of a comet has been viſible at a place where the head has been all the while under the horizon; ſuch an appearance is called a *beam*. As the tail of a comet is owing to the heat of the ſun, it grows larger as the comet approaches near to, and ſhortens as it recedes from, that luminary.

The FIXED STARS, when viewed through the beſt teleſcopes appear not in the leaſt magnified, but rather diminiſhed, on account, as is thought by ſome, that the teleſcope takes off that twinkling appearance they make to the naked eye; but by others more probably, that the teleſcopic tube excludes a quantity of the rays of light, which are not only emitted from the particular ſtars themſelves, but by many thouſands more, which falling upon our eyelids and the aerial particles about us, are reflected into our eyes ſo ſtrongly as to excite vibrations, not only on thoſe points of the retina where the images of the ſtars are formed, but alſo in other points at the ſame diſtance round about. This without the teleſcope makes us imagine the ſtars to be much bigger than when we ſee them only by a few rays coming directly from them, ſo as to enter our eye without being intermixed with others.

The NUMBER of ſtars appears prodigiouſly increaſed through the teleſcope; 70 ſtars have been counted in the conſtellation called *Pleiades*, and no fewer than 2000 in that of Orion. The late improvements of Herſchel, however, have ſhown the number of ſtars to be exceedingly beyond even what the diſcoveries of former aſtronomers would induce us to ſuppoſe. He has alſo ſhown, that many, which, to the eye, or through ordinary glaſſes, appear ſingle, do in fact conſiſt of two or more ſtars; and that the Galaxy or Milky Way owes its light entirely to multitudes of ſmall ſtars placed ſo cloſe, that the naked eye, or even ordinary teleſcopes, cannot diſtinguiſh them.

The NEBULÆ, or ſmall whitiſh ſpecks, diſcoverable by teleſcopes in various parts of the heavens, are owing to the ſame cauſe. Former aſtronomers could only reckon 103; but Herſchel has diſcovered upwards of 1250. He has alſo diſcovered a ſpecies of them, which he calls *planetary nebulæ*, on account of their brightneſs, and ſhining with a well defined diſk.

SECT. III. CONCLUSIONS *drawn from the* APPEARANCES *of the* SUN *and* PLANETS.

Various and contradictory have been the conjectures of aſtronomers with reſpect to the nature of the celeſtial bodies, many of which being both abſurd and whimſical, it will be unneceſſary for us to repeat.

The ſun's equator makes an angle with the ecliptic of about 7½°. This plane continued cuts the ecliptic in two oppoſite points, which are called the *ſun's nodes*, being 10° of ♊ and 10° of ♐; and two points in the ecliptic, 90° from the nodes, may be called the *limits*. Theſe are 10° of ♍ and 10° of ♓.

As to the MOON, it is allowed on all hands, that there are prodigious inequalities on her ſurface. This is proved by looking at her through a teleſcope, at any other time than when ſhe is full; for then there is no regular line bounding light and darkneſs; but the confines of theſe parts appear as it were toothed and cut with innumerable notches and breaks; and even in the dark part, near the borders of the lucid ſurface there are ſeen ſome ſmall ſpaces enlightened by the ſun's beams. Upon the fourth day after new moon, there may be perceived ſome ſhining points like rocks or ſmall iſlands within the dark body of the moon; and not far from the confines of light and darkneſs there are obſerved other little ſpaces which join to the enlightened ſurface, but run out into the dark ſide, which by degrees change their figure, till at laſt they come wholly within the illuminated face, and have no dark parts round them at all. Afterwards many more ſhining ſpaces are obſerved to ariſe by degrees, and to appear within the dark ſide of the moon, which, before they drew near to the confines of light and darkneſs, were inviſible, being without any light, and totally immerſed in the ſhadow. The contrary is obſerved in the decreaſing phaſes, where the lucid ſpaces which joined the illuminated ſurface by degrees recede from it; and, after they are quite ſeparated from the confines of light and darkneſs, remain for ſome time viſible, till at laſt they alſo diſappear. Now it is impoſſible, that this ſhould be the caſe, unleſs theſe ſhining points were higher than the reſt of the ſurface, ſo that the light of the ſun may reach them.

Aſtronomers have endeavoured to meaſure the height of theſe lunar mountains, in the following manner. Let E G D, Plate XV. fig. 3, be the hemiſphere of the moon illuminated by the ſun, E C D, the diameter of the circle bounding light and darkneſs, and A the top of a hill within the dark part when it firſt begins to be illuminated. Obſerve with a teleſcope the proportion of the right line A E, or the diſtance of the point A from the lucid ſurface to the diameter of the moon E D; and becauſe in this caſe the ray of light E S touches the globe of the moon, A E C will be a right angle, and therefore in the triangle A E C having the two ſides A E and E C, we can find out the third ſide A C; from which ſubducting B C or E C, there will remain A B the height of the mountain. By this mode of meaſuring, which would be juſt if the line A E could be taken accurately, the height of St. Catharine would be nearly 8½ miles, if according to Riccioli its top was about a ſixteenth part of the moon's diameter diſtant from the confines of the lucid ſurface. But by the more accurate obſervations and juſt calculations of Herſchel, this diſproportionate height appears to be ill founded, and the generality of the lunar mountains do not exceed half a mile in perpendicular elevation. Thus he calculates their heights: Let S L M, or *s l m*, fig. 4, be a line drawn from the ſun to the mountain, touching the moon at L or *l*, and the mountain at M or *m*. Then, to an obſerver, at E or *e*, the lines L M, *l m*, will not appear of the ſame length, though the mountain ſhould be of an equal height; for L M will be projected into *o n*, and *l m* into O N. But theſe are the quantities that are taken by the micrometer when we obſerve a mountain to project from the line of illumination. From the obſerved quantity *o n*, when the moon is not in her quadrature, to find L M, we have the following analogy. The triangles *o* O L, *r* M L, are ſimilar; therefore L *o* : L O :: L *r* : L M, or $\frac{LO \times on}{Lo} = LM$: but L O is the radius of the moon, and L *r* or *o n* is the obſerved diſtance of the mountain's projection; and L *o* is the ſine of the angle R O L = *o* L S; which we may take to be the diſtance of the ſun from the moon without any material error, and which we may find at any given time from an ephemeris.

Some modern aſtronomers have diſcovered a ſtill greater ſimilarity between the lunar mountains and thoſe of our earth: viz. that ſome of them are really volcanoes, and emit fire, as ours do. An appearance of this kind was diſcovered ſome years ago by Ulloa, in an eclipſe of the ſun. It was a ſmall bright ſpot like a ſtar near the margin of the moon, and which he at that time ſuppoſed to have been a hole with the ſun's light ſhining through it. Succeeding obſervations, however, have induced aſtronomers to attribute appearances of this kind to the eruption of volcanic fire; and Herſchel has particularly obſerved ſeveral eruptions of the lunar volcanoes, which he has deſcribed in the Philoſophical Tranſactions.

Many conjectures have been formed reſpecting the nature of the moon's ſubſtance. Some have imagined, that, beſides the light reflected from the ſun, the moon hath alſo ſome obſcure light of her own, by which ſhe would be viſible without being illuminated by the ſun-beams. In proof of this it is urged, that during the time of even total eclipſes, the moon is ſtill viſible, appearing of a dull red colour, as if obſcured by a great deal of ſmoke. In reply to this it hath been advanced, that this is not always the caſe; the moon ſometimes diſappearing totally in the time of an eclipſe, ſo as not to be deſcribable by the beſt glaſſes, while little ſtars of the fifth and ſixth magnitudes, were diſtinctly ſeen as uſual; and when the moon is viſible in a total eclipſe, a ſufficient reaſon may be aſſigned for this appearance from the refraction of the ſun's rays through our atmoſphere, which are reflected back to the earth by the otherwiſe dark ſurface of the moon.

Various ſpeculations have been indulged concerning the ſpots on the moon's ſurface. Some philoſophers have been ſo taken with the beauty of the brighteſt places obſerved in her diſk, that they have imagined them to be rocks of diamonds; and others have compared them to pearls and precious ſtones. Keill and the greater part of aſtronomers are now of opinion, that theſe are only the tops of mountains, which by reaſon of their elevation are more capable of reflecting the ſun's light than others which are lower. The duſkiſh ſpots, he ſays, cannot be ſeas, nor any thing of a liquid ſubſtance; becauſe, when examined by the teleſcope, they appear to conſiſt of an infinity of caverns and empty pits, whoſe ſhadows fall within them, which can never be the caſe with ſeas, or any liquid ſubſtance; but, even within theſe ſpots, brighter places are alſo to be obſerved; which, according to his hypotheſis, ought to be the points of rocks ſtanding up within the cavities. Dr. Long, however, is of opinion, that ſeveral of the dark ſpots on the moon are real water.

It has been a matter of diſpute whether the moon has any atmoſphere or not. The following arguments have been urged on the negative ſide: 1. The moon conſtantly appears with the ſame brightneſs where there are no clouds in our atmoſphere; which could not be the caſe, if ſhe were ſurrounded with an atmoſphere like ours, ſo variable in its denſity, and ſo frequently obſcured by clouds and vapours. 2. In an appulſe of the moon to a ſtar, when ſhe comes ſo near it that a part of her atmoſphere is interpoſed between our eye and the ſtar, refraction would cauſe the latter to ſeem to change its place; ſo that the moon would appear to touch it later than by her own motion ſhe would do. 3. Some philoſophers are of opinion, that becauſe there are no ſeas or lakes in the moon, there is therefore no atmoſphere, as there is no water to be raiſed up in vapours.

To theſe arguments, it has been replied; I. That the moon does not always appear with the ſame brightneſs, even when our atmoſphere appears equally clear. Hevelius relates, that he has ſeveral times found in ſkies perfectly clear, when even ſtars of the 6th and 7th magnitude were viſible, that at the ſame altitude of the moon, and the ſame elongation from the earth, and with one and the ſame teleſcope, the moon and its maculæ do not appear equally lucid, clear, and conſpicuous at all times; but are much brighter and more diſtinct at ſome times than at others. From the circumſtances of this obſervation, ſay they, it is evident that the reaſon of this phenomenon is neither in our air, in the tube, in the room, nor in the ſpectator's eye; but muſt be looked for in ſomething exiſting about the moon. An additional argument is drawn from the different appearances of the moon in total eclipſes, which are ſuppoſed to be owing to the different conſtitutions of the lunar atmoſphere.

II. To the ſecond argument, Dr. Long replies, that Sir Iſaac Newton has ſhown, that the weight of any body upon the moon is but a third part of what the weight of the ſame would be upon the earth: now the expanſion of the air is reciprocally as the weight that compreſſes it; the air, therefore, ſurrounding the moon, being preſſed together by a weight, or being attracted towards the centre of the moon, by a force equal only to one third of that which attracts our air towards the centre of the earth, it follows, that the lunar atmoſphere is only one third as denſe as that of the earth, which is too little to produce any ſenſible refraction of the ſtars' light. Other aſtronomers have contended, that ſuch refraction was ſometimes very apparent. Caſſini ſays, that he frequently obſerved Saturn, Jupiter, and the fixed ſtars to have their circular figure changed into an elliptical one, when they approached either to the moon's dark or illuminated limb; though they own, that in other occultations no ſuch change could be obſerved. With regard to the fixed ſtars, indeed, it has been urged, that, granting the moon to have an atmoſphere of the ſame nature and quantity as ours, no ſuch effect as a gradual diminution of light ought to take place; at leaſt, that we could by no means be capable of perceiving it. Our atmoſphere is found to be ſo rare at the height of 44 miles, as to be incapable of refracting the rays of the light. This height is the 180th part of the earth's diameter; but ſince clouds are never obſerved higher than four miles, we muſt conclude that the vaporous or obſcure part is only the 1980th. The mean apparent diameter of the moon is 31′ 29″, or 1889 ſeconds: therefore the obſcure parts of her atmoſphere, when viewed from the earth, muſt ſubtend an angle of leſs than one ſecond; which ſpace is paſſed over by the moon in leſs than two ſeconds of time. It cannot therefore hardly be expected that obſervation ſhould generally determine whether the ſuppoſed obſcuration takes place or not.

III. The third argument is neceſſarily inconcluſive, becauſe we know not whether there is any water in the moon or not; nor, though this could be demonſtrated, would it follow, that the lunar atmoſphere anſwers no other purpoſe than the raiſing of water into vapour.

IV. There is, beſides, a ſtrong argument in favour of the exiſtence of a lunar atmoſphere, taken from the appearance of a luminous ring round the moon in the time of ſolar eclipſes; a circumſtance frequently obſerved by aſtronomers, particularly in the *total eclipſe* of the ſun in 1706; and in another total eclipſe of the ſun, in April 1715, when certain ſtreaks of light were ſeen to dart from different places of the moon, during the time of total darkneſs. Theſe were imagined to be flaſhes of lightning, and hence the exiſtence of clouds and vapours, and an atmoſphere have been inferred. Theſe flaſhes might be connected with ſuch appearances, as Dr. Herſchel, has, with great probability concluded to be volcanoes, which have alſo been conſidered as a proof of the lunar atmoſphere.

We have already obſerved, that the occultations of the fixed ſtars and planets, by the moon, in general happen without any kind of refraction of their light by the lunar atmoſphere. The contrary, however, has ſometimes, it is ſaid, been obſerved, and the ſtars have been ſeen manifeſtly to change their ſhape and colour on going behind the moon's diſk; but by many this colour has been attributed rather to the different refrangibility of the rays, in the object glaſs of the teleſcope, than to any real variation of colour in the planets or ſtars from appulſe to the moon.

It has been a queſtion, whether the moon and other planets are inhabited? The anſwers given to it in the negative depend on the poſition, that human beings could not exiſt in any of the planets on account of their diſtance from the ſun, and conſequent inequality of heat to that which the inhabitants of the earth experience; and the want of an atmoſphere in the moon would as effectually preclude that body from being a fit habitation for man. But in reply it is argued, and with reaſon, that the ſame power which could make the earth a fit habitation for the animals upon it, could alſo adopt the organs of other animals to their various ſituations in the planets: and as the earth teems with life of all kinds, we may conclude, that as there is ſo great analogy between it and the planets in other reſpects, the ſame analogy prevails with reſpect to life and inhabitants.

SECT. IV. CONJECTURES *and* CONCLUSIONS *reſpecting* COMETS.

None of the celeſtial bodies have given riſe to a greater degree of ſpeculation and conjectures, than the comets. Their ſtrange appearances has in all ages been a matter of terror to the vulgar, who uniformly have looked upon them as bad omens and forerunners of war, peſtilence, &c. Others leſs ſuperſtitious, ſuppoſed them to be meteors raiſed in the higher regions of the air. After much ſpeculation and conjecture among aſtronomers, Tycho Brache reſtored the comets to their true rank in the creation, and Sir Iſaac Newton at laſt diſcovered their true motion, from the obſervations he made on the great comet of 1680. This deſcended almoſt perpendicularly towards the ſun with a prodigious velocity; aſcending again with a motion retarded, as much as it had been before accelerated. It was ſeen in the morning by a great numbers of aſtronomers in different parts of Europe, from the 4th to the 25th of November, in its way towards the ſun; and in the evening from the 12th of December to the 9th of March following. The many exact obſervations made on this comet enabled Sir Iſaac Newton to determine, that they are a kind of planets, which move in very excentric ellipſes; and this opinion is now conſidered as an eſtabliſhed truth.

Although the orbs of all comets are very excentric ellipſes, there are vaſt differences among them. Excepting Mercury, there are no great differences among the planets either as to the excentricity of their orbits, or the inclination of their planes; but the planes of ſome comets are almoſt perpendicular to others, and ſome of their ellipſes are much wider than others. The narroweſt ellipſis of any comet hitherto obſerved was that of 1680. There is alſo a much greater inequality in the motion of the comets than of the planets; the velocity of the former being incomparably greater in their perihelion than in their aphelion; but the planets are but very little accelerated.

It is now the general opinion of aſtronomers, that comets are opaque bodies enlightened by the ſun. Sir Iſaac Newton, in confirmation of this, obſerves, that if a comet be ſeen in two parts of its orbit, at equal diſtances from the earth, but at unequal diſtances from the ſun, it always ſhines brighteſt in that neareſt the ſun.

Comets are of very different MAGNITUDES, which may be conjectured from their apparent diameter and brightneſs.

The TAILS of comets have given riſe to various conjectures; though it is acknowledged by all, that they depend on the ſun ſome way or other, as they are always turned from him; but in what manner this is accompliſhed, we cannot eaſily determine.

The analogy diſcovered by Kepler, between the periodical times of the planets and their diſtances from the ſun, takes place alſo in the comets. In conſequence of this, the mean diſtance of a comet from the ſun may be found by comparing its period with the time of the earth's revolution round the ſun. Thus the period of the comet that appeared in 1531, 1607, 1682, and 1759, being about 76 years, its mean diſtance from the ſun may be found by this proportion: As 1, the ſquare of one year, the earth's periodical time, is to 5776 the ſquare of 76, the comet's periodical time; ſo is 1,000.000, the cube of 100, the earth's mean diſtance from the ſun, to 5,776,000,000, the cube of the comet's mean diſtance. The cube root of this laſt number is 1794; the mean diſtance itſelf in ſuch parts as the mean diſtance from the earth from the ſun contains 100. If the perihelion diſtance of the comet, 58, be taken from 3588 double the mean diſtance, we ſhall have the aphelion diſtance, 3530, of ſuch parts as the diſtance of the earth contains 100; which is a little more than 35 times the diſtance of the earth from the ſun. By a like method, the aphelion diſtance of the comet of 1680 comes out 138 times the mean diſtance of the earth from the ſun, ſuppoſing its period to be 575 years; ſo that this comet, in its aphelion, goes more than 14 times the diſtance from the ſun that Saturn does. Euler computes the orbit of this comet from three of Flamſtead's obſervations taken near together, compared with a fourth taken at ſome diſtance from the other three; and from thence concludes the period to be a little more than 170 years.

SECT. V. CONJECTURES *and* CONCLUSIONS *reſpecting the* FIXED STARS.

Aſtronomers have ſuppoſed the innumerable multitude of fixed ſtars to be ſo many ſuns, each of which is attended by a certain number of planets or habitable worlds like our own, as well as viſited by comets. The ſtrongeſt argument for this hypotheſis is, that the ſtars cannot be magnified by a teleſcope on account of their immenſe diſtance; whence we muſt conclude they ſhine by their own light, and are therefore ſo many ſuns; each of which we may ſuppoſe to be equal, if not ſuperior, in luſtre and magnitude to our own.—They are not ſuppoſed to be at equal diſtances from us, but to be more remote in proportion to their apparent ſmallneſs. This ſuppoſition is neceſſary to prevent any interference of their planets: and thus there may be as great a diſtance between a ſtar of the firſt magnitude and one of the ſecond apparently cloſe to it, as between the earth and the fixed ſtars firſt mentioned.

Others object, that the diſappearance of ſome of the fixed ſtars is a demonſtration that they cannot be ſuns, as it would be to the higheſt degree abſurd, to think that God would create a ſun which might diſappear of a ſudden, and leave its planets and their inhabitants in endleſs night. But this argument will have no weight with thoſe who believe in the doctrines of revelation; which aſſures us, that our world will come to an end, and that our ſun will be deprived of his light; and conſequently that all the planets, which circulate around him, will be involved in darkneſs.

In ſhort, there is nothing inconſiſtent with either ſcripture or reaſon, in ſuppoſing, that while infinite ſpace is univerſally filled with illuminating ſuns, and circulating planets, each world, or rather each *ſolar ſyſtem* of worlds, has its own periods of creation, duration and final conſummation; as we are aſſured ours *has* had, and *will* have. And the diſcoveries of aſtronomers reſpecting old ſtars diſappearing, and new ones being obſerved, are perfectly conſiſtent with the doctrines of creation and diſſolution, which all Chriſtians profeſs to believe, with regard to our own ſolar ſyſtem and the globe we inhabit: They ſeem to afford, likewiſe, a pretty ſtrong argument againſt the theories of Dr. TOULMIN and other philoſophers, who plead for the *eternity of the world*, and *of the univerſe*.

Some, however, have thought that the variable ſtars which diſappear for a time, were planets, which were only viſible during ſome part of their courſe. But this their apparent immobility, notwithſtanding their decreaſe of luſtre, will not allow us to think. Some have imagined, that one ſide of them might be naturally much darker than the other, and when, by the revolution of the ſtar upon its axis, the dark ſide was turned towards us, the ſtar became inviſible, and for the ſame reaſon, after ſome interval, reſumed its former luſtre.

In the Philoſophical Tranſactions for 1783, Mr. Michell, in propoſing a method to determine the diſtance, magnitude, &c. of the fixed ſtars by the diminution of the velocity of their light, ſhould any ſuch thing be diſcovered, ſuppoſes that by far the greater part, if not all of them, are ſyſtems of ſtars ſo near each other, as probably to be liable to be affected ſenſibly by their mutual gravitation; and that it is therefore not unlikely, that the periods of the revolutions of ſome of theſe about their principals (the ſmaller ones being, upon this hypotheſis, to be conſidered as ſatellites to the others) may ſome time or other be diſcovered.

Herschel, improving on Michell's idea of the fixed ſtars being collected into groups, and aſſiſted by his own obſervations with the extraordinary teleſcopic powers already mentioned, has ſuggeſted a theory concerning the conſtruction of the univerſe entirely new and ſingular. It had been the opinion of former aſtronomers, that our ſun, beſides occupying the centre of the ſyſtem which properly belongs to him, occupied alſo the centre of the univerſe: but Herſchel is of a different opinion.

"Hitherto (ſays the Dr.) the ſidereal heavens have, not inadequately for the purpoſe deſigned, been repreſented by the concave ſurface of a ſphere, in the centre of which the eye of the obſerver might be ſuppoſed to be placed. It is true, the various magnitudes of the fixed ſtars even then plainly ſuggeſted to us, and would have better ſuited, the idea of an expanded firmament of three dimenſions; but the obſervations upon which I am now going to enter, ſtill farther illuſtrate and enforce the neceſſity of conſidering the heavens in this point of view. In future therefore we ſhall look upon thoſe regions into which we may now penetrate by means of ſuch large teleſcopes, as a naturaliſt regards a rich extent of ground or chain of mountains, containing ſtrata variouſly inclined and directed, as well as conſiſting of very different materials. A ſurface of a globe or map therefore will but ill delineate the interior parts of the heavens."

Dr. Herschel's obſervations, on which this theory is founded, were made with a Newtonian reflector of 20 feet focal length, and an aperture of 18 inches. With this powerful teleſcope, he firſt began to ſurvey the Via Lactea, and found that it completely reſolved the whitiſh appearance into ſtars, which the teleſcopes he formerly uſed had not light enough to do. The portion he firſt obſerved was that about the hand and club of Orion; in which he found an aſtoniſhing multitude of ſtars, whoſe number he endeavoured to eſtimate by counting many *fields* (or *apparent ſpaces* of the heavens, which he could ſee at once through his teleſcope,) and computing from a medium of theſe how many might be contained in a given portion of the Milky Way. In the moſt vacant place to be met with in that neighbourhood, he found 63 ſtars; other ſix fields contained 110, 60, 70, 90, 70, and 74 ſtars; a medium of all which gave 79 for the number of ſtars to each field.—Thus he found, that by allowing 15″ for the diameter of his field of view, a belt of 15° long and 2 broad, which he had often ſeen paſs before his teleſcope in an hour's time, could not contain leſs than 50,000 ſtars, large enough to be diſtinctly numbered; beſides which, he ſuſpected twice as many more, which could be ſeen only now and then by faint glimpſes, for want of ſufficient light.

The Doctor's ſucceſs within the Milky Way ſoon induced him to turn his teleſcope to the nebulous parts of the heavens, of which an accurate liſt had been publiſhed in the *Connoiſſance des Temps* for 1783 and 1784. Moſt of theſe yielded to a Newtonian reflector of 20 feet focal diſtance and 12 inches aperture; which plainly diſcovered them to be compoſed of ſtars, or at leaſt to contain ſtars, and to ſhew every other indication of conſiſting of them entirely.

"The nebulæ (ſays he) are arranged into ſtrata, and run on to a great length; and ſome of them I have been able to purſue, and to gueſs pretty well at their form and direction. It is probable enough, that they may ſurround the whole ſtarry ſphere of the heavens, not unlike the Milky Way, which undoubtedly is nothing but a ſtratum of fixed ſtars; and as this latter immenſe ſtarry bed is not of equal breadth or luſtre in every part, nor runs on in one ſtraight direction, but is curved, and even divided into two ſtreams along a very conſiderable portion of it; we may likewiſe expect the greateſt variety in the ſtrata of the cluſters of ſtars and nebulæ.

"One of the nebulous beds is ſo rich, that, in paſſing through a ſection of it in the time of only 36 minutes, I have detected no leſs than 31 nebulæ, all diſtinctly viſible upon a fine blue ſky. Their ſituation and ſhape, as well as condition, ſeem to denote the greateſt variety imaginable. In another ſtratum, or perhaps a different branch of the former, I have often ſeen double and treble nebulæ variouſly arranged; large ones with ſmall ſeeming attendants; narrow, but much extended lucid nebulæ or bright daſhes; ſome of the ſhape of a fan, reſembling an electric bruſh iſſuing from a lucid point; others of the cometic ſhape, with a ſeeming nucleus in the centre, or like cloudy ſtars, ſurrounded with a nebulous atmoſphere: a different ſort again contain a nebuloſity of the Milky kind, like that wonderful inexplicable phænomenon about Orionis; while others ſhine with a fainter mottled kind of light, which denotes their being reſolvable into ſtars.

"It is very probable that the great ſtratum called the Milky Way, is that in which the ſun is placed, though perhaps not in the very centre of its thickneſs. We gather this from the appearance of the galaxy, which ſeems to encompaſs the whole heavens, as it certainly muſt do if the ſun is within the ſame. For ſuppoſe a number of ſtars arranged between two parallel planes, indefinitely extended every way, but at a given conſiderable diſtance from one another, and calling this a ſidereal ſtratum; an eye, placed ſomewhere within it, will ſee all the ſtars in the direction of the planes of the ſtratum projected into a great circle, which will appear lucid on account of the accumulation of the ſtars, while the reſt of the heavens at the ſides will only ſeem to be ſcattered over with conſtellations, more or leſs crowded according to the diſtance of the planes, or number of ſtars contained in the thickneſs or ſides of the ſtratum.

"Thus in fig. 6. Plate XV. an eye at S within the ſtratum *a b*, will ſee the ſtars in the direction of its length *a b*, or height *e d*, with all thoſe in the intermediate ſituation, projected into the lucid circle ABCD; while thoſe in the ſides *m e*, *n w*, will be ſeen ſcattered over the remaining part of the heavens at MVNW. If the eye were placed ſomewhat without the ſtratum, at no very great diſtance, the appearance of the ſtars within it would aſſume the form of one of the leſſer circles of the ſphere, which would be more or leſs contracted to the diſtance of the eye; and if this diſtance were exceedingly increaſed, the whole ſtratum might at laſt be drawn together into a lucid ſpot of any ſhape, according to the poſition, length, and height of the ſtratum. Let us now ſuppoſe, that a branch or ſmaller ſtratum ſhould run out from the former in a certain direction, and let it alſo be contained between two parallel planes extended indefinitely onwards, but ſo that the eye may be placed in the great ſtratum ſomewhere before the ſeparation, and not far from the place where the ſtrata are ſtill united; then will this ſecond ſtratum not be projected into a bright circle like the former, but will be ſeen as a lucid branch proceeding from the firſt, and returning to it again at a certain diſtance leſs than a ſemicircle. Thus, in the ſame figure, the ſtars in the ſmall ſtratum *p g* will be projected into a bright arch at PRB, which, after its ſeparation from the circle CBD, unites with it again at P.

"What has been inſtanced in parallel planes may eaſily be applied to ſtrata irregularly bounded, and running in various directions; for their projection will of conſequence vary according to the quantities of the variations in the ſtrata and the diſtance of the eye from the ſame. And thus any kind of curvatures, as well as various degrees of brightneſs, may be produced in the projections.

"From appearances, then, as I obſerved before, we may infer, that the ſun is moſt likely placed in one of the great ſtrata of the fixed ſtars, and very probably not far from the place where ſome ſmaller ſtratum branches out from it. Such a ſuppoſition will ſatisfactorily, and with great ſimplicity, account for all the phænomena of the Milky Way; which, according to this hypotheſis, is no other than the appearance of the projection of the ſtars contained in this ſtratum and its ſecondary branch. As a farther inducement to look on the galaxy in this point of view, let it be conſidered, that we can no longer doubt of its whitiſh appearance ariſing from the mixed luſtre of the numberleſs ſtars that compoſe it. Now, ſhould we ſuppoſe it to be an irregular ring of ſtars, in the centre nearly of which we muſt then ſuppoſe the ſun to be placed, it will appear not a little extraordinary, that the ſun, being a fixed ſtar like thoſe which compoſe this imagined ring, ſhould juſt be in the centre of ſuch a multitude of celeſtial bodies, without any apparent reaſon for this ſingular diſtinction; whereas, on our ſuppoſition, every ſtar in this ſtratum, not very near the termination of its length or height, will be ſo placed as to have its own galaxy, with only ſuch variations in the form and luſtre of it as may ariſe from the particular ſituation of each ſtar."

A continued ſeries of obſervations confirmed Dr. Herſchel in theſe opinions; and in a ſucceeding paper he has given a ſketch of his ideas of the interior conſtruction of the heavens.—"That the Milky Way (ſays he) is a moſt extenſive ſtratum of ſtars of various ſizes, admits no longer of the leaſt doubt; and that our ſun is one of the heavenly bodies belonging to it is as evident. I have now viewed and gauged this ſhining zone in almoſt every direction, and find it compoſed of ſhining ſtars, whoſe number, by the account of thoſe gauges, conſtantly increaſes and decreaſes in proportion to its apparent brightneſs to the naked eye."

"But in order to develope the ideas of the univerſe that have been ſuggeſted by my late obſervations, it will be beſt to take the ſubject from a point of view at a conſiderable diſtance both of ſpace and time. Let us then ſuppoſe numberleſs ſtars of various ſizes ſcattered over an infinite portion of ſpace, in ſuch a manner as to be almoſt equally diſtributed through the whole. The laws of attraction, which no doubt extend to the remoteſt regions of the fixed ſtars, will operate in ſuch a manner as moſt probably to produce the following remarkable effects.

"I. It will frequently happen, that a ſtar, being conſiderably larger than its neighbouring ones, will attract them more than they will be attracted by others that are immediately around them; by which means they will be in time, as it were, condenſed about a centre; or, in other words, form themſelves into a cluſter of ſtars of almoſt a globular figure, more or leſs regularly ſo according to the ſize and original diſtance of the ſurrounding ſtars. The perturbations of the mutual attractions muſt undoubtedly be very intricate, as we may eaſily comprehend by conſidering what Sir Iſaac Newton has ſaid, (*Princip. lib.* i. *prob.* 38. *et seq.*) but in order to apply this great author's reaſoning, of bodies moving in ellipſes, to ſuch as are here for a while ſuppoſed to have no other motion, than what their mutual gravity has imparted to them, we muſt ſuppoſe the conjugate axes of theſe ellipſes indefinitely diminiſhed, whereby the ellipſes will become ſtraight lines.

"II. The next caſe, which will happen almoſt as frequently as the former, is where a few ſtars, though not ſuperior in ſize to the reſt, may chance to be rather nearer each other than the ſurrounding ones; for here alſo will be formed a prevailing attraction in the combined centre of gravity of them all, which will occaſion the neighbouring ſtars to draw together; not, indeed, ſo as to form a regular globular figure, but, however, in ſuch a manner as to be condenſed towards the common centre of gravity of the whole irregular cluſter. And this conſtruction admits of the utmoſt variety of ſhapes, according to the number and ſituation of the ſtars which firſt gave riſe to the condenſation of the reſt.

"III. From the compoſition and repeated conjunction of both the foregoing forms, a third may be derived, when many large ſtars, or combined ſmall ones, are ſituated in long extended regular or crooked rows, hooks, or branches; for they will alſo draw the ſurrounding ones ſo as to produce figures of condenſed ſtars coarſely ſimilar to the former, which gave riſe to theſe condenſations.

"IV. We may likewiſe admit of ſtill more extenſive combinations; when, at the ſame time that a cluſter of ſtars is forming in one part of ſpace, there may be another collecting in a different, but perhaps not far diſtant, quarter, which may occaſion a mutual approach towards their common centre of gravity.

"V. In the laſt place, as a natural conſequence of the former caſes, there will be great cavities or vacancies formed by the retreat of the ſtars towards the various centres which attract them; ſo that, upon the whole, there is evidently a field of the greateſt variety for the mutual and combined attractions of the heavenly bodies to exert themſelves in.

"From this theoretical view of the heavens, which has been taken from a point not leſs diſtant in time than in ſpace, we will now retreat to our own retired ſtation, in one of the planets attending a ſtar in its great combination with numberleſs others; and in order to inveſtigate what will be the appearances from this contracted ſituation, let us begin with the naked eye. The ſtars of the firſt magtude, being in all probability the neareſt, will furniſh us with a ſtep to begin our ſcale. Setting off, therefore, with the diſtance of Sirius or Arcturus, for inſtance, as unity, we will at preſent ſuppoſe, that thoſe of the ſecond magnitude are at double, thoſe of the third at treble, the diſtance, &c. Taking it for granted, then, that a ſtar of the 7th magnitude (the ſmalleſt ſuppoſed viſible with the naked eye) is about 7 times as far as one of the firſt, it follows, that an obſerver, who is incloſed in a globular cluſter of ſtars, and not far from the centre, will never be able with the naked eye to ſee to the end of it; for ſince, according to the above eſtimations, he can only extend his view to above 7 times the diſtance of Sirius, it cannot be expected that his eyes ſhould reach the borders of a cluſter which has perhaps not leſs than 50 ſtars in depth every where around him. The whole univerſe to him, therefore, will be compriſed in a ſet of conſtellations richly ornamented with ſcattered ſtars of all ſizes: Or, if the united brightneſs of a neighbouring cluſter of ſtars ſhould, in a remarkably clear night, reach his ſight, it will put on the appearance of a ſmall, faint, whitiſh, nebulous cloud, not to be perceived without the greateſt attention.

"Let us ſuppoſe him placed in a much extended ſtratum, or branching cluſter of millions of ſtars, ſuch as may fall under the third form of nebulæ already conſidered. Here alſo the heavens will not only be richly ſcattered over with brilliant conſtellations, but a ſhining zone or Milky Way will be perceived to ſurround the whole ſphere of the heavens, owing to the combined light of theſe ſtars which are too ſmall, that is, too remote to be ſeen. Our obſerver's ſight will be ſo confined, that he will imagine this ſingle collection of ſtars, though he does not even perceive the 1000th part of them, to be the whole contents of the heavens.

"Allowing him now the uſe of a common teleſcope, he begins to ſuſpect, that all the milkineſs of the bright path which ſurrounds the ſphere may be owing to ſtars. He perceives a few cluſters of them in various parts of the heavens, and finds alſo that there are a kind of nebulous patches: but ſtill his views are not extended to reach ſo far as to the end of the ſtratum in which he is ſituated; ſo that he looks upon theſe patches as belonging to that ſyſtem, which to him ſeems to comprehend every celeſtial object. He now increaſes his power of viſion; and applying himſelf to a cloſe obſervation, finds that the Milky Way is indeed no other than a collection of very ſmall ſtars. He perceives, that thoſe objects which had been called *nebulæ*, are evidently nothing but cluſters of ſtars. Their number increaſes upon him; and when he reſolves one nebula into ſtars, he diſcovers ten new ones which he cannot reſolve. He then forms the idea of immenſe ſtrata of fixed ſtars, of cluſters of ſtars and of nebulæ; till, going on with ſuch intereſting obſervations, he now perceives, that all theſe appearances muſt naturally ariſe from the confined ſituation in which we are placed. *confined* it may juſtly be called, though in no leſs a ſpace than what appeared before to be the whole region of the fixed ſtars, but which now has aſſumed the ſhape of a crooked brancking nebula; not indeed one of the leaſt, but perhaps very far from being the moſt conſiderable, of thoſe numberleſs cluſters that enter into the conſtruction of the heavens."

Dr. HERSCHEL ſhows, that this theoretical view of the heavens is perfectly conſiſtent with facts, and ſeems to be confirmed by a ſeries of obſervations. Many hundreds of nebulæ of the 1ſt and 2d forms are to be ſeen in the heavens; and their places, he ſays, will hereafter be pointed out; many of the 3d form deſcribed, and inſtances of the 4th related; a few of the cavities mentioned in the 5th particulariſed, though many more have been already obſerved: ſo that, "upon the whole (ſays he,) I believe it will be found, that the foregoing theoretical view, with all its conſequential appearances, as ſeen by an eye incloſed in one of the nebulæ, is no other than a drawing from nature, wherein the features of the original have been cloſely copied: and I hope the reſemblance will not be called a bad one, when it ſhall be conſidered how very limited muſt be the pencil of an inhabitant of ſo ſmall and retired a portion of the infinite ſyſtem in attempting the picture of ſo unbounded an extent."

The doctor having determined that the viſible ſyſtem of nature, by us called the UNIVERSE, *conſiſting of all* the celeſtial bodies, and many more than can be ſeen by the naked eye, is only a group of ſtars or ſuns with their planets, conſtituting one of thoſe patches called a *nebula*, and perhaps not one ten thouſandth part of what is really the univerſe, he goes on to delineate the figure of this vaſt nebula, which he is of opinion may now be done; and for this purpoſe, he gives a table, calculating the diſtance of the ſtars which form its extreme boundaries, or the length of the viſual ray in different parts, by the number of ſtars contained in the field of his teleſcope at different times. He then proceeds to offer ſome thoughts on the origin of the nebulous ſtrata of the heavens; in doing which, he gives ſome hints concerning the antiquity of them.

"If it were poſſible, (ſays he) to diſtinguiſh between the parts of an indefinitely extended whole, the nebula we inhabit might be ſaid to be one that has fewer marks of antiquity than any of the reſt. To explain this idea, perhaps more clearly, we ſhould recollect, that the condenſation of cluſters of ſtars has been aſcribed to a gratual approach; and whoever reflects on the number of ages that muſt have paſſed before ſome of the cluſters that are to be found in my intended catalogue of them could be ſo far condenſed as we find them at preſent, will not wonder, if I aſcribe a certain air of youth and vigour, to many very regularly ſcattered regions of our ſiderial ſtratum. There are moreover, many places in it, in which, if we may judge from appearances, there is the greateſt reaſon to believe, that the ſtars are drawing towards ſecondary centres, and will in time ſeparate into cluſters, ſo as to occaſion many ſubdiviſions.

"Hence we may ſurmiſe, that when a nebulous ſtratum conſiſts chiefly of nebulæ of the firſt and ſecond forms, it probably owes its origin to whatmay be called the decay of a great compound nebula of the third form; and that the ſubdiviſions which happened to it in length of time, occaſioned all the ſmall nebulæ which ſprung from it to lie in a certain range, according as they were detached from the primary one. In like manner, our ſyſtem, after numbers of ages, may very poſſibly become divided, ſo as to give riſe to a ſtratum of two or three hundred nebulæ; for it would not be difficult to point out ſo many beginning or gathering cluſters in it.

“This throws a conſiderable light, upon that remarkable collection of many hundreds of nebulæ, which are to be ſeen in what I have called the *nebulous ſtratum* in Coma Berenices. It appears from the extended and branching figure of our nebula, that there is room for the decompoſed ſmall nebulæ of a large reduced former great one, to approach nearer to us in the ſides, than in any other parts. Nay, poſſibly there might originally be another very large joining branch, which in time became ſeparated by the condenſation of the ſtars: and this may be the reaſon of the little remaining breadth of our ſyſtem in that very place; for, the nebulæ of the Coma are brighteſt and moſt crowded, juſt oppoſite to our ſituation, or in the pole of our ſyſtem.

“As ſoon as this idea was ſuggeſted, I tried alſo the oppoſite pole; where, accordingly, I have met with a great number of nebulæ, though under a much more ſcattered form. Some parts of our ſyſtem indeed, ſeem already to have ſuſtained greater ravages of time than others; for inſtance, in the body of the Scorpion, is an opening or hole, which is probably owing to this cauſe. It is at leaſt 4° broad; but its height I have not yet aſcertained. It is remarkable, that the 80 *Nebuleuſe ſans Etoiles* of the *Connoiſſance des Temps*, which is one of the richeſt and moſt compreſſed cluſters of ſmall ſtars I remember to have ſeen, is ſituated juſt on the weſt border of it, and would almoſt authoriſe a ſuſpicion, that the ſtars of which it is compoſed, were collected from that place, and had left the vacancy. What adds not a little to this ſurmiſe, is, that the ſame phænomenon is once more repeated with the fourth cluſter of the *Connoiſſance des Temps*; which is alſo on the weſtern border of another vacancy, and has, moreover, a ſmall miniature cluſter, or eaſily reſolvable nebula, of about 2½ minutes in diameter north, following it at no very great diſtance.

“There is a remarkable purity or clearneſs in the heavens, when we look out of our ſtratum at the ſides; that is, towards Leo, Virgo, and Coma Berenices on one hand, and towards Cetus on the other; whereas, the ground of the heavens becomes troubled as we approach towards the length or height of it. Theſe troubled appearances are eaſily to be explained by aſcribing them to ſome of the diſtant ſtraggling ſtars that yield hardly light enough to be diſtinguiſhed. And I have indeed often experienced this to be the cauſe, by examining the ſpots for a long while together, when at laſt I generally perceived the ſtars which occaſioned them. But, when we look towards the poles of our ſyſtems, where the viſual ray does not graze along the ſide, the ſtraggling ſtars will of courſe be very few in number; and therefore, the ground of the heavens will aſſume that purity which I have always obſerved to take place in thoſe regions.”

Dr. Herſchel here applies the name of *poles* to thoſe points which are 90° diſtant from a circle paſſing along the Milky Way. The north pole is ſituated in R. Aſ. 186°, and diſtant from the pole of the world 58°.

According to Herſchel, then, the univerſe conſiſts of *nebulæ*, or innumerable collections of innumerable ſtars, each individual of which, is a ſun not only equal, but much ſuperior to ours: and none of the celeſtial bodies in our nebula are nearer to one another than we are to Sirius, whoſe diſtance is ſuppoſed not to be leſs than 400,000 times that of the ſun from us, or 38 millions of millions of miles. The whole extent of the nebula being in ſome places near 500 times as great, muſt be ſuch, that the light of a ſtar placed at its extreme boundary, ſuppoſing it to fly with the velocity of 12 millions of miles every minute, muſt have taken near 3000 years to reach us. Herſchel, however, is by no means of opinion, that our nebula is the moſt conſiderable in the univerſe.

“As we are uſed (ſays he) to call the appearance of the heavens, where it is ſurrounded with a bright zone, the *Milky Way*, it may not be amiſs to point out ſome other very remarkable nebulæ, which cannot well be leſs, but are probably much larger, than our own ſyſtem; and being alſo extended, the inhabitants of the planets that attend the ſtars which compoſe them, muſt likewiſe perceive the ſame phænomena; for which reaſon, they may alſo be called *Milky Ways*, for diſtinction's ſake. My opinion of their ſize is grounded on the following obſervations: There are many round nebulæ of the firſt form, of about five or ſix minutes in diameter, the ſtars of which I can ſee very diſtinctly; and on comparing them with the viſual ray calculated from ſome of my long gauges, I ſuppoſe by the appearance of the ſmall ſtars in thoſe gauges, that the centres of theſe round nebulæ may be 600 times the diſtance of Sirius from us.”

He then tells us, that the ſtars in ſuch nebulæ, are probably twice as much condenſed as thoſe of our ſyſtem; otherwiſe, the centre of it would not be leſs than 6000 times the diſtance of Sirius from us; and that it is poſſibly much under-rated, by ſuppoſing it only 600 times the diſtance of that ſtar.

“Some of theſe round nebulæ (ſays Herſchel) have others near them, perfectly ſimilar in form, colour, and the diſtribution of ſtars, but of only half the diameter: and the ſtars in them ſeem to be doubly crowded, and only at about half the diſtance from each other. They are indeed ſo ſmall, as not to be viſible without the utmoſt attention. I ſuppoſe theſe miniature nebulæ to be at double the diſtance of the firſt.

“An inſtance equally remarkable and inſtructive is, a caſe, where, in the neighbourhood of two ſuch nebulæ as have been mentioned, I met with a third ſimilar, reſolvable, but much ſmaller and fainter nebula. The ſtars of it are no longer to be perceived; but a reſemblance of colour with the former two, and its diminiſhed ſize and light, may well permit us to place it at full twice the diſtance of the firſt. And yet the nebuloſity is not of the milky kind; nor is it ſo much as difficultly reſolvable or colourleſs. Now in a few of the extended nebulæ, the light changes gradually, ſo as from the reſolvable to approach to the milky kind; which appears to me an indication, that the milky light of nebulæ is owing to their much greater diſtance. A nebula, therefore, whoſe light is perfectly milky, cannot well be ſuppoſed to be at leſs than 6,000 or 8,000 times the diſtance of Sirius; and though the numbers here aſſumed are not to be taken otherwiſe than as very coarſe eſtimates, yet an extended nebula, which an oblique ſituation, where it is poſſibly fore-ſhortened by one half, two 3ds, or three 4ths of its length, ſubtends a degree or more in diameter, cannot be otherwiſe than of a wonderful magnitude, and may well outvie our Milky Way in grandeur."

After giving an account of ſeveral remarkable nebulæ, Dr. Herſchel concludes thus: "Now, what great length of time muſt be required to produce theſe effects (the formation of nebulæ) may eaſily be conceived, when, in all probability, our whole ſyſtem, of about 800 ſtars in diameter, if it were ſeen at ſuch a diſtance, that one end of it might aſſume the reſolvable nebuloſity, would not, at the other end, preſent us with the irreſolvable, much leſs with the colourleſs and milky nebuloſities." Great, indeed, muſt be the length of time, requiſite for ſuch diſtant bodies to form combinations by the laws of attraction, ſince, according to the diſtances he has aſſumed, the light of ſome of his nebulæ muſt be 36,000 or 48,000 years in arriving from them to us. It would be worth while then to enquire whether *attraction* is propagated in time or not; or whether it moves quicker or ſlower than light?

An objection naturally occurred, in the courſe of Herſchel's obſervations and enquiries concerning the ſtructure of the heavens, that if the different ſyſtems were formed by the mutual attractions of the ſtars, the whole would be in danger of deſtruction by the falling of them one upon another. A ſufficient anſwer to this, he thinks, is, that if we can really prove the ſyſtem of the univerſe to be what he has ſaid, there is no doubt that the great Author of it has amply provided for the preſervation of the whole, though it ſhould not appear to us in what manner this is effected.

Several circumſtances, however, he ſays, manifeſtly tend to a general preſervation. The indefinite extent of the ſideral heavens, muſt produce a balance that will effectually ſecure all the great parts of the whole from approaching to each other. "There remains then, (ſays he) only to ſee how the particular ſtars belonging to ſeparate cluſters are prevented from ruſhing on to their centres of attraction." This he ſuppoſes may be done by PROJECTILE FORCES; "the admiſſion of which will prove ſuch a barrier againſt the ſeeming deſtructive power of attraction, as to ſecure from it all the ſtars belonging to a cluſter, if not for ever, at leaſt for millions of ages. Beſides, we ought perhaps to look upon ſuch cluſters, and the deſtruction of a ſtar now and then in ſome thouſands of ages, as the very means by which the whole is preſerved and renewed. Theſe cluſters may be the *laboratories* of the univerſe, wherein the moſt ſalutary remedies for the decay of the whole are prepared."

The exiſtence of ſuch projectile forces is rendered probable, from the apparent changes of poſition of certain ſtars, and from a compariſon of the beſt modern obſervations with the moſt accurate of former times, there appears to have been a real change in the places of ſome of them. The Bull's Eye, Sirius, and Arcturus, are now found to be half a degree more ſoutherly than the ancients reckoned them, and the bright ſtar in the ſhoulder of Orion, has, in Ptolemy, almoſt a whole degree of latitude more ſoutherly than at preſent. Dr. Herſchel has lately obſerved, that the diſtance and poſition of the two ſtars, forming the double ſtar, r Draconis, is different from what it was in Flamſtead's time. So conſiderable is the change of diſtance, (for it is 16″ 6) that he thinks we can hardly account for it otherwiſe, than by admitting a proper motion in the one or other of the ſtars, or in our ſolar ſyſtem; moſt probably, he ſays, neither of the three is at reſt.

If our ſolar ſyſtem do really change its place in abſolute ſpace, in proceſs of time, an apparent change in the angular diſtances of ſome of the fixed ſtars will appear, and the neareſt being more affected than ſuch as are more remote, their relative poſitions may ſeem to alter, although the ſtars were really immoveable, and *vice versa*, we may ſurmiſe, from the obſerved motions of the ſtars, that our ſun, with all its planets and comets, may have a motion towards ſome particular part of the heavens, on account of a greater quantity of matter collected in a number of ſtars, and their ſurrounding planets there ſituated, which may occaſion a gravitation of our whole ſolar ſyſtem towards it. On the other hand, if our ſyſtem be at reſt, and any of the ſtars really in motion, this might likewiſe vary their apparent poſition, and the more ſo, the nearer they are to us, or the ſwifter their motions are, or the more proper the direction of the motion is, to be rendered *perceptible by us*.

PART II.

OF THE VARIOUS SYSTEMS OF ASTRONOMY.

SECT. I. *Of the* MOST FAMOUS SYSTEMS, *by which the* CELESTIAL PHÆNOMENA *have been* ATTEMPTED *to be* EXPLAINED.

To explain the motions and appearances of the heavenly bodies, various hypotheſes have been formed; and every hypotheſis that ever was framed, accounted for ſome one or other of them; but men being, in the early ages, ignorant of the laws of motion, it could not be expected, that they could diſcover the true ſyſtem, or explain all the various phænomena, of the celeſtial orbs.

In treating of the various ſyſtems which have been invented in different ages, we do not mean to give an account of the various abſurdities that have been broached by individuals on this ſubject; but ſhall confine ourſelves to thoſe ſyſtems which have been of conſiderable note, and been generally followed for a number of years. Concerning the opinions of the very firſt aſtronomers about the ſyſtem of nature, we are as ignorant as we are of thoſe aſtronomers themſelves. Whatever opinions are handed down to us, muſt be of a vaſtly later date than the introduction of aſtronomy among mankind.

If we may hazard a conjecture, however, we are inclined to think, that the firſt opinions on this ſubject were much more juſt, than thoſe that were held afterwards for many years. PYTHAGORAS maintained the motion of the earth, which is now univerſally believed, but at that time appears to have been the opinion of only a few detached individuals of Greece. As the Greeks borrowed many things from the

Egyptians, and Pythagoras had travelled into Egypt and Phenicia, it is probable he might receive an account of this hypotheſis from thence: but whether he did ſo or not, we have now no means of knowing, neither is it of any importance. Certain it is, however, that this opinion did not prevail in his days, nor for many ages afterwards.

In the 2d century the very name of the Pythagorean hypotheſis was ſuppreſſed, by a ſyſtem erected by the famous geographer and aſtronomer, CLAUDIUS PTOLEMÆUS. This ſyſtem, which commonly goes by the name of the PTOLEMAIC, he ſeems not to have originally invented, but adopted as the prevailing one of that age; and perhaps made it ſomewhat more conſiſtent than it was before. He ſuppoſed the earth at reſt in the centre of the univerſe. Round the earth, and the neareſt to it of all the heavenly bodies, the moon performed its monthly revolutions. Next to the moon was placed the planet Mercury; then Venus; and above that the Sun, Mars, Jupiter, and Saturn, in their proper orbits; then the ſphere of the fixed ſtars; above theſe, two ſpheres of what he called *chryſtalline* heavens; above theſe was the primum mobile, which by turning round once in 24 hours, by ſome unaccountable means or other, carried all the reſt along with it. This primum mobile was encompaſſed by the empyrean heaven, which was of a cubic form, and the ſeat of angels and bleſſed ſpirits. Beſides the motions of all the heavens round the earth once in 24 hours, each planet was ſuppoſed to have a particular motion of its own; the moon, for inſtance, once in a month, performed an additional revolution, the ſun in a year, &c.

It is evident, that on this ſuppoſition, the confuſed motions of the planets already deſcribed could never be accounted for. Had they circulated uniformly round the earth, their apparent motion ought always to have been equal and uniform, without appearing either ſtationary or retrograde in any part of their courſes. In conſequence of this objection, Ptolemy was obliged to invent a great number of circles, interfering with each other, which he called *epicycles* and *excentrics*. This ſyſtem continued to be in vogue till the beginning of the 16th century, when it was ſuperceded by the COPERNICAN.

The only other ſyſtems, worth mentioning, beſides the true ſyſtem, are the *Tychonic*, the *Semi-Tychonic*, and the *Carteſian;* all of which have gained proſelytes, though none of them were ever ſo univerſally received, as the Ptolemaic and Copernican.

The TYCHONIC SYSTEM was invented by TYCHO BRAHE, who ſuppoſed the earth abſolutely at reſt, and that the moon and ſun revolved about the earth; the moon in a month, and the ſun in a year; and at the ſame time, that the reſt of the planets, Mercury, Venus, Mars, Jupiter, and Saturn, revolved round the ſun; the three laſt alſo encompaſſing the earth. Beſides theſe motions, he ſuppoſed them all to have a diurnal motion round the earth, as well as all the ſtars.

The SEMI-TYCHONIC SYSTEM ſuppoſed the planets to revolve round the ſun, while the ſun and moon revolve about the earth as their centre of motion; and it ſuppoſed the earth to move about its axis from weſt to eaſt in 24 hours. This ſyſtem differs from the Tychonic only in this, that it ſuppoſes a diurnal motion in the earth, but, like the Tychonic, denies an annual one.

The CARTESIAN SYSTEM, ſo named, from its author DES CARTES, ſuppoſes a variety of vortices or whirlpools, in which the motions of the heavenly bodies are performed, being carried round the ſun in a vortex of ethereal matter, in different times, proportioned to their diſtances; and each planet having alſo a particular vortex of its own, in which the motions of its ſatellites are performed. From the laws of motion it will eaſily appear, that the irregular motions of the planets cannot be accounted for by theſe vortices; and beſides, the ſuppoſition of an ethereal matter, to perform the operations, is without any foundation, or analogy in nature.

SECT. II. *Of the* COPERNICAN *or* TRUE SYSTEM *of* ASTRONOMY.

The Ptolemaic ſyſtem had gained univerſal credit, when COPERNICUS began to entertain doubts of its truth; and to try if a more ſatisfactory method, of accounting for the apparent motions of the celeſtial bodies, might not be obtained, than it afforded. He had recourſe to every author upon the ſubject, but obtained no ſatisfaction, till he found from CICERO, that NICETAS the Syracuſan had maintained the MOTION OF THE EARTH; and from Plutarch, that Pythagoras and others of the ancients had been of the ſame opinion.

From theſe ſmall hints, this great genius deduced a moſt complete ſyſtem of aſtronomy, capable of ſolving every phænomenon in a ſatisfactory manner:—a ſyſtem, which has been more and more confirmed, by the diſcoveries and improvements that have been made in aſtronomy and mathematics, ſince his time; as well as by the uſe of teleſcopes, which have diſcovered numerous celeſtial phænomena formerly quite unknown. Like all important diſcoveries, however, when they run counter to general prejudices, the Copernican ſyſtem was at firſt much oppoſed; and by none more than the celebrated Tycho Brahe, who could never aſſent to the motion of the earth, and who invented the ſyſtem deſcribed in laſt ſection, with a view to ſuperſede the neceſſity of it.

But while philoſophers were divided between the Ptolemaic, the Tychonic, the Carteſian, and Copernican ſyſtems, Sir Iſaac Newton laid down the laws of nature and motion, and, comparing all the phænomena in the heavens, found out the true ſyſtem of the univerſe, confirmed the Copernican ſyſtem of aſtronomy, and demonſtrated by unanſwerable arguments, that it could not poſſibly be otherwiſe, without the utter ſubverſion of all the laws of nature. This ſyſtem, founded on the laws of nature, and true mechanical principles, is as follows.

The ſun is placed nearly in the centre of the orbits of all the planets, and in theſe orbits they move round the ſun, each in its periodic time. The ſun keeps always in or near the ſame place; but has a rotation round its axis from weſt to eaſt in about 25 days. The orbits of all the planets are nearly circular, having the ſun for their centre; but in ſtrictneſs they are ellipſes, having the ſun in the focus of each of them. Theſe orbits are not all in one plane, and yet do not vary a great deal; they interſect one another in lines that paſs through the centre of the ſun; the places of the orbits where they interſect are called the *nodes*. All the planets move round the ſun the ſame way, which is from weſt to eaſt, and are called *primary planets*. Their names and order are, Mercury, Venus, the Earth, Mars, Jupiter, Saturn, and Herſchel, or the Georgium Sidus. Four of theſe have others revolving about them, which likewiſe revolve from weſt to eaſt, and are called *ſecondary planets* or *ſatellites*. The earth has one called the MOON, which revolves in $27\frac{1}{3}$ days. Jupiter has four, Saturn 7, and the Georgium Sidus two. For the characteriſtic marks of the ſun and planets.

Beſides the planets and their ſatellites, there is another ſort of bodies revolving about the ſun, which only appear at particular times. Theſe are the COMETS, which move either in very long ellipſes, to an immenſe diſtance from the ſun; or in parabolic curves; and then they never return. Theſe move in all manner of directions round the ſun; ſome the ſame way as the planets, and ſome the contrary way; they cut the plane of the earth's orbit in all ſorts of angles, ſome greater and ſome leſs. Some of theſe bodies are ſeveral hundred years in making a revolution; and therefore the periodic times of few of them are known. Nor can their number be determined for want of a proper ſeries of obſervations. There have not been above 80 of theſe bodies obſerved; and of theſe ſome may perhaps be the ſame, coming about again. The whole liſt of comets upon record, that have been noticed, amount to 450, or at moſt 500. They are diſtinguiſhed from other ſtars, by a luminous ſtream of light which they emit, (called the tail,) when they come near the ſun.

The FIXED STARS are at an immenſe diſtance; for by the niceſt obſervations, they have no annual ſenſible parallax; that is, they appear to the earth when on different ſides of its orbit to be exactly in the ſame places; and the Earth's orbit ſeen from a fixed ſtar, will appear only as a point. Conſequently, the fixed ſtars all ſhine with their own native light: for it would be impoſſible for light, tranſmitted from the ſun to them, ever to be viſible, as it would be infinitely weak at that immenſe diſtance.

The diſtance of the ſun is immenſely great, in compariſon of that of the moon, although it is almoſt nothing in reſpect of that of the fixed ſtars. For the ſun's diurnal parallax, that is, the apparent ſemidiameter of the earth ſeen from the ſun, is ſo ſmall, that no inſtruments could be ſo exactly made as to find it. Hence it is inferred that the ſun's magnitude is vaſtly greater than the earth's. For ſuppoſing the ſun's parallax to amount to as much as a minute, then ſince the apparent diameter of the ſun is half a degree, this would make the ſun's diameter 15 times as big as the earth's; but the ſun's parallax is no ſuch thing, for it is found not to exceed 8″. 7, which will make the ſun's diameter 100 times as big as the earth's. That the ſun is of a globular form, is plain from the apparent motion of the ſpots upon its ſurface; for while the ſun moves uniformly about its axis, the ſpots in the middle of the diſk move very quick, but near the edges grow ſlower and ſlower, agreeable to the motion of a globe about its axis. By obſervation of theſe ſpots, the ſun is found to revolve about its axis in 25 or 26 days.

None of the celeſtial bodies, in our planetary ſyſtem, ſhine with their own native light, except the ſun; ſo that all the planets, both primary and ſecondary are opake bodies, that is, have no other light but what they receive from the ſun, and reflect it back towards the earth and other planets. This is evident from the moon: for only that ſide of her is obſerved to ſhine which is directly oppoſed to the ſun; but the other ſide which is from the ſun is quite dark, except ſo far as it is illuminated by the reflection from the earth; for the more of the illuminated ſide that is turned towards the earth, the more we ſee her enlightened, the reſt being dark; and the more of her dark ſide that is turned towards the earth, the more of her appears dark. Thus at the full ſhe appears all enlightened, and at her change all dark.

Mercury and Venus exhibit ſimilar phænomena, and ſhew all the phaſes of the moon, according to their various ſituations; and ſometimes appear like a black ſpot upon the body of the ſun. Mars likewiſe appears gibbous when near the quadratures with the ſun. The ſatellites of Jupiter are eclipſed when they are behind his body, being then immerſed in his ſhadow; they likewiſe caſt their ſhadows upon the body of Jupiter. And in Saturn the ſhadow of the ring upon his body proves his opacity. And the weakneſs of the light of thoſe that are far diſtant from the ſun, ſhows that it is not innate but borrowed.

All the planets are ſpherical, and all or moſt of them have a rotation round their axis. Theſe motions are found by means of certain ſpots upon their ſurfaces, which give us the time of their rotation. For want of ſuch marks, the times of the rotation of ſome planets, have not yet been diſcovered. That they are ſpherical bodies appears from the ſlow motion of the ſpots near the edges, and their ſwifter motion near the middle: And the line ſeparating the illuminated part from the dark being always elliptical, proves their figure to be ſpherical.

SATURN, beſides his ſeven ſatellites, is encompaſſed with a thin concentrical ring, whoſe diameter is more than double his diameter; and whoſe breadth is equal to the hollow ſpace between it and his body. The plane of this ring makes an angle of 31 degrees with the ecliptic, and coincides nearly with the orbits of the ſatellites. This ring revolves in that plane, in the nature of a ſatellite, or rather of a vaſt number of ſatellites, which touch one another, and compoſe the ring. In ſome places of his orbit his ring cannot be ſeen, when its plane paſſes through the earth. In other poſitions it is viſible more or leſs.

The body of Jupiter is alſo encompaſſed with ſeveral dark lines, called Jupiter's BELTS; which run about his body parallel to his equator. But theſe belts are obſerved not to be permanent, but to increaſe and decreaſe; and undergo ſeveral changes, as do the ſpots upon his ſurface.

The ſurface of the moon is rough and uneven, and full of innumerable mountains, valleys, and deep pits. This is plain from the line that divides the light from the dark part, for this is always jagged and uneven; the higher parts running more into the dark than the lower. The high mountainous parts caſt a ſhadow to a great diſtance, which gradually grows ſhorter, as the ſun's light comes more perpendicular; and by degrees the light ſhines into the hollows and valleys, and then the ſhadows of the edges g diſappear. There are ſeveral ſpots in the moon, brighter, and ſome duller; but no changes had ever b obſerved in them, and they keep their places, magni and colour. There are ſuppoſed to be no clouds, rain, or water in the moon; for ſhe always has the ſame appearance.

nce. There are no rivers, nor ſeas; for ſuch places as re ſmooth, and look moſt like ſeas, are full of ſmall hills nd hollows, and the like irregularities; and therefore can ontain no waters. She always turns the ſame face near-y, towards the earth. The moon is far leſs than any of the planets, and yet appears vaſtly greater, becauſe it is much nearer than any of the reſt.

The following tables contain a ſynopſis of the periods, diſtances, &c. of the ſun and planets, according to the lateſt and beſt obſervations.

TABLE I.

	Periodical revolutions round the ſun.	Proportional mean diſtances from the ſun.	Mean diſtances from the ſemidiameters of the earth.	Mean diſtances from the ſun in Engliſh miles.	Excentricities, or diſtances of the focus from the centre.
	D. H. M.				
Mercury.	87 23 15½	·3871	9210	37,000,000	7960
Venus.	224 16 49¼	·72333	17210	68,000,000	510
The Earth.	365 6 9¼	1·	23799	95,000,000	1680
Mars.	686 23 30¾	1·52369	36262	144,000,000	14218
Jupiter.	4332 8 51½	5·20098	123778	490,000,000	25277
Saturn.	10761 14 36¾	9·53937	227028	900,000,000	53163
Herschel.	30445 18	19·03421	453000	1,800,000,000	4759

TABLE II.

	Greateſt apparent diameter, as ſeen from the earth.	Diam. in Engliſh miles.	Diurnal rotations upon their axis.	Inclinations of their orbits to the ecliptic.	Place of the aſcending node.
			D. H. M. S.		s. ° ′
The Sun.	32′ 36″	883217	25 15 16 0		
Mercury.	11	3222	unknown.	7° 0′	1 15 46¼
Venus.	58	7687	0 23 22 0	3 23⅓	2 14 44
The Earth.		7964	0 23 56 4		
Mars.	25	4189	0 24 39 22	1 51	1 17 59
Jupiter.	46	89170	0 9 56 0	1 19¼	3 8 50
Saturn.	20	79042	0 10 16 0	2 30⅓	3 21 48¼
Herschel.	4	35109	unknown.	0 48	3 13 1

TABLE III.

	Greateſt elongation of inferior, and parallax of ſuperior planets.	Proportion of light and heat.	Bulk in reſpect to the earth.	Proportion of denſity.	Place of the aphelion.
The Sun.			1380000	¼	s. ° ′
Mercury.	28° 20′	6·68	$\frac{1}{15}$	2	8 14 13
Venus.	47 48	1·91	$\frac{9}{10}$	1¼	10 9 38
The Earth.		1	1	1	9 9 15¼
Mars.	47 24	·43	$\frac{7}{30}$	$\frac{7}{100}$	5 2 6¼
Jupiter.	11 51	·037	1400	$\frac{2}{100}$	6 10 57½
Saturn.	6 29	·011	1000	$\frac{1}{5}$	9 0 45½
Herschel.	4 4½	·00276	90	$\frac{11}{50}$	11 23 23

SECT. III. *Of the* ORBITS *and* MOTIONS *of the* PRIMARY PLANETS.

Before the time of KEPLER, aſtronomers ſuppoſed that the planets moved in circular orbits with uniform motions, and that the ſun was not in the centres of the circles, but at ſome diſtance from it. But this juſtly celebrated aſtronomer inſtead of taking for granted the truth of the hypotheſis of his predeceſſors, applied himſelf with diligence, to make obſervations on the heavenly bodies, and from his great accuracy in the obſervations, and ſagacity in making deductions from them, he has been conſidered as at the head of modern reformed aſtronomy. He alſo made uſe of the obſervations of Tycho Brache, and, after much labour, and many miſtakes, he at laſt diſcovered the great laws of the planetary motions, which are hence called KEPLER'S LAWS. They are theſe:

I. The primary planets and comets deſcribe round the ſun, and the ſecondary planets deſcribe round their reſpective primary planets, areas proportional to the times.

II. The orbits deſcribed round the ſun, and round the primary planets, are ellipſes, having the ſun or the primary planets in the focus.

III. The ſquares or the periodic times of planets revolving round common centres, are proportional to the cubes of their mean diſtances.

Theſe laws were deduced by Kepler entirely from obſervations, and it is obvious, that they are the very ſame which Sir Iſaac Newton has inveſtigated by geometrical reaſoning, as the neceſſary conſequences of a body revolving in an ellipſe by a force directed towards one of its foci.

We are therefore warranted to conclude, that the planets are kept in their obits by a force which are directed to the ſun, that the influence of his force extends to the utmoſt boundaries of the ſolar ſyſtem, and we can aſſign no reaſon why it may not extend to all diſtances whatever, obſerving the ſame law as the ſagacity of Newton has inveſtigated.

It is not, however, to be underſtood that the ſun remains abſolutely at reſt, and that the planets are urged towards it, as to an immoveable point. Sir I. Newton has ſhewn, that the tendency of the planets towards the ſun, ariſes from a very general law, which not only connects the planets with the ſun, but extends from each individual particle of matter to every other particle of matter in the ſolar ſyſtem; a particular caſe of this law or fact, is the gravity of bodies at the ſurface of our earth, and the general law which includes all particular caſes, has been termed GRAVITATION. Hence it follows, that not only the planets gravitate towards the ſun, but the ſun gravitates towards the planets; ſo that, in ſtrict truth, both the ſun and each planet revolve round a point, which is their common centre of gravity, and which is as much nearer to the ſun than to the planet, as the ſun contains more matter than the planet.

The truth of this general law is only to be proved by a careful examination of particular caſes; and, ſuppoſing it to be true, the effects it ought to produce in the planetary motions round the ſun, are in perfect coincidence with the beſt obſervations.

If all matter gravitates to, or is attracted by all other matter, it is evident that the planets muſt alſo gravitate towards each other; and thus in ſome meaſure the uniformity of their motions round the ſun will be effected. Now this is really found to be the caſe by the moſt accurate obſervations; and the effects produced are preciſely what they ought to be, ſuppoſing that the law, which regulates the tendency of the planets towards the ſun, alſo regulates their tendency to one another.

SECT. IV. *Of the* ORBITS *and* MOTIONS *of the* SECONDARY PLANETS.

The ſame general principle of gravitation by which the motions of the primary planets are produced, and they made to move round the ſun as a centre; extends alſo to the motions of the ſecondary planets, both in regard to their motion round the ſun along with their primaries, and to their motions round their primaries as a centre; and from obſervations on the ſecondary planets we get an additional proof of this general law, that all matter gravitates to all other matter with a force reciprocally proportional to the ſquare of the diſtance.

That each ſecondary planet is kept in its orbit by a power directed towards its primary, &c. is proved from the phenomena of the ſatellites of Jupiter and Saturn; becauſe they move in circles, as far as we can obſerve, about their reſpective primaries with an equable courſe, the primary being the centre of each orbit: and by comparing the times in which the different ſatellites of the ſame primary perform their periods, they are found to obſerve the ſame relation to the diſtances from their primary, as the primary planets obſerve in reſpect of their mean diſtances from the ſun. The ſame thing holds good alſo with regard to the earth and moon; for ſhe is found to move round the earth in an ellipſis after the ſame manner as the primary planets do about the ſun, excepting only ſome ſmall irregularities in her motions, the cauſe of which will be particularly explained in what follows; and it will appear that they are no objections againſt the earth's acting on the moon in the ſame manner as the ſun acts on the primary planets; that is, as Jupiter and Saturn act upon their ſatellites.

How faſt bodies fall near the ſurface of the earth may be known by the pendulum; and by exact experiments, they are found to deſcend the ſpace of $16\frac{1}{8}$ feet in one ſecond; and the ſpaces deſcribed by falling bodies being in the duplicate proportion of the times of their fall, the number of feet a body would deſcribe in its fall near the ſurface of the earth in one minute of time, would be equal to $16\frac{1}{8}$ twice multiplied by 60; the ſame as the power which acts upon the moon would cauſe.

The earth, in this computation, is ſuppoſed to be at reſt; but it would have been more exact to ſuppoſe it to move, as well as the moon, about their common centre of gravity. The action of the ſun upon the moon is alſo here neglected; and Newton ſhews, if you take in both theſe conſiderations, the preſent computation will beſt agree to a ſomewhat greater diſtance of the moon and earth, viz. to $60\frac{1}{2}$ ſemidiameters of the latter, which diſtance is more conformable to aſtronomical obſervations; and theſe computations afford an additional proof that the action of the earth obſerves the ſame proportion to the diſtance which is here contended for.

Hence it follows, that the power which retains the moon in her orbit is the ſame as that which cauſes bodies near the ſurface of the earth to gravitate ; for ſince the power by which the earth acts on the moon will cauſe bodies near the ſurface of it to deſcend with all the velocity they are found to do, it is certain no other power can act upon them beſides ; becauſe, if it did, they muſt of neceſſity deſcend ſwifter ; and it is at length very evident, that the power in the earth which we call *gravity*, extends up to the moon, and decreaſes in the duplicate proportion of the increaſe of the diſtance from the earth. If to the motion of the ſatellite whereby it would be carried round its primary at reſt, we ſuperadd the ſame motion, both in regard to the velocity and direction, as the primary itſelf has, it will deſcribe about the primary the ſame orbit with as great regularity as if the primary had been indeed at reſt. This proceeds from the law of motion, which makes a body near the ſurface of the earth deſcend perpendicularly, though the earth be in a ſwift motion, that if the falling body did not partake of it, its deſcent would be remarkably oblique.

From this we learn, that if the ſatellite moved about its primary with perfect regularity, beſides it motion about the primary it would have the ſame progreſſive velocity with which the primary is carried about the ſun, in a direction parallel to that impulſe of its primary. And, on the contrary, the want of either of theſe, in particular of the impulſe towards the ſun, will occaſion great inequalities in the motion of the ſecondary planet. The inequalities which would ariſe from the abſence of this impulſe towards the ſun are ſo great, that by the regularity which appears in the motion of the ſecondary planets, it is proved, that the ſun communicates to them the ſame velocity by its action as it gives to their primary at the ſame diſtance. Newton informs us, that upon examination he found, that if any of the ſatellites of Jupiter were attracted by the ſun more or leſs than Jupiter himſelf at the ſame diſtance, the orbit of that ſatellite, inſtead of being concentrical to Jupiter, would have its centre at a greater or leſs diſtance than the centre of Jupiter from the ſun, nearly in the ſubduplicate proportion of the difference between the ſun's action upon the ſatellite and upon Jupiter. Therefore, if any ſatellite were attracted by the ſun but 100th part more or leſs than Jupiter is at the ſame diſtance, the orbit of that ſatellite would be diſtant from the centre of Jupiter no leſs than a 5th part of the outermoſt ſatellite from Jupiter ; which is almoſt the whole diſtance of the innermoſt ſatellite. By the like argument, the ſatellites of Saturn gravitate towards the ſun as much as Saturn itſelf at the ſame diſtance, and the moon as much as the earth.

The ſun therefore acts upon the ſecondary planets as much as upon the primaries at the ſame diſtance : but the action of the ſun upon bodies is reciprocally in the duplicate proportion of the diſtance ; therefore the ſecondary planets being ſometimes nearer to the ſun than the primary, and ſometimes more remote, they are not always acted upon in the ſame degree with their primary, but when nearer to the ſun are attracted more, and when farther off are attracted leſs. Hence ariſe various inequalities in the motions of the ſecondary planets. Some of theſe inequalities, however, would take place, though the moon, if undiſturbed by the ſun, had moved in a circle concentrieal to the earth, and in the plane of the earth's motion ; others depend on the elliptical figure and oblique ſituation of the moon's orbit. One of the former is, that the moon does not deſcribe equal ſpaces in equal times, but is continually accelerated as ſhe paſſes from the quarter to the new or full, and is retarded again by the like degrees in returning from the new and full to the next quarter : but here we conſider not ſo much the abſolute as the apparent motions of the moon with reſpect to us.

A ſecond effect of the ſun upon the moon is, that it gives the orbit of the latter in the quarters, a greater degree of curvature than it would receive from the earth alone ; and, on the contrary, in the conjunction and oppoſition the orbit is leſs inflected. When the moon is in the conjunction with the ſun, the latter attracting her more forcibly than it does the earth, the moon is by that means impelled leſs to the earth than otherwiſe it would be, and thus the orbit leſs incurvated : again, when the moon is in the oppoſition, farther removed from the ſun than the earth is, though the earth and moon are both drawn by the ſun towards itſelf out of the place they would otherwiſe move into, yet the moon deſcends with leſs velocity than the earth : inſomuch that, in any given ſpace of time from its paſſing the point of oppoſition, it will have leſs approached the earth than otherwiſe it would have done ; that is, its orbit, in reſpect to the earth, will approach nearer to a ſtraight line.—When the moon is in the third quarter, and equally diſtant from the ſun as the earth, they will both deſcend with equal velocity towards the ſun, ſo as to make no change in the moon's elongation from the ſun ; but the moon's diſtance from the earth muſt neceſſarily be ſhortened.—Therefore, the moon, in moving from her quadrature toward the conjunction with the ſun, will be impelled more toward the earth by the ſun's action, than it would have been by the earth alone, if neither the earth nor the moon had been acted upon by the ſun ; ſo that, by this additional impulſe, the orbit is rendered more curve, than it otherwiſe would be. The ſame effect will alſo be produced in the other quarter.

A third effect of the ſun's action is, that though the moon, undiſturbed by the ſun, might move in a circle, having the earth for its centre, by the ſun's action, if the earth were to be in the very middle or centre of the moon's orbit, the moon would be nearer the earth at the new and full, than in the quarters. This may at firſt appear ſomewhat difficult to be underſtood, that the moon ſhould come neareſt to the earth where it is leaſt attracted by it : yet, upon a little conſideration, it will evidently appear to flow from that very cauſe, becauſe her orbit, in the conjunction and oppoſition, is rendered leſs curve ; for the leſs curve the orbit is, the leſs will the moon have deſcended from the place it would move into without the action of the earth.

If the moon were to move from any place without further diſturbance from that action, ſince it would proceed on the line touching the orbit in that place, it would continually recede from the earth ; and therefore, if the power of the earth upon the moon be ſufficient to retain it at the ſame diſtance, the diminution of that power will cauſe the diſtance to increaſe, though in a leſs degree. But, on the other hand, in the quarters, the moon being preſſed in a leſs degree towards the earth, than by the earth's ſingle action, will be made to approach it ; ſo that, in paſſing from the conjunction or oppoſition to the quarters, the moon aſcends

termine the place of any of the celeſtial bodies; and the ſuperior brightneſs of the ſun renders them totally inviſible, except in the time of a great eclipſe, when his light is for a time totally obſcured. But though we cannot know the place of the ſun directly, it is eaſily found from a knowledge of theſe fixed ſtars which are oppoſite to him.

Thus, in Plate XXII. fig. 6, ſuppoſe it the time of the year in which the earth is at *g*, if we know that the point G is then diametrically oppoſite to the ſun, we know that A, its oppoſite, is the ſun's place, and conſequently, by finding the places throughout the year diametrically oppoſite to the ſun, as GHIKLMABCDEF, we may be aſſured that in theſe times the ſun's place was in the points ABCD EFGHIKLM. The point in the heavens diametrically oppoſite to the ſun may be known every night at 12 o'clock when the ſtars are viſible; for the ſtar which has an elevation above the horizon, at that time equal to the ſun's depreſſion below it, is directly oppoſite to him.

When the ECLIPTIC is thus found, the latitude of the moon or any ſtar is counted by its diſtance from the ecliptic, in the ſame manner as the latitudes of places on the earth are reckoned by their diſtance from the equator, and circles paſſing through the poles of the ecliptic at right angles to its plane, are called *circles of latitude* The DECLINATION of any celeſtial body is its deviation from the equator towards the pole neareſt to it.

The LATITUDE of any planet is either *heliocentric* or *geocentric*. The *heliocentric latitude* is its diſtance from the ecliptic as ſeen from the ſun, and its *geocentric* as ſeen from the earth. As the orbits of the planets are inclined in different angles to the ecliptic, the heliocentric latitude of any planet is almoſt always different from its geocentric latitude. Thus, let AB, Plate XXII. fig. 7, be the orbit of the earth, C D the orbit of Venus, viewed with the eye in their common ſection, wherein they appear ſtraight lines; let E and F be two oppoſite points of the ecliptic; and ſuppoſe Venus to be in the point C. If ſhe were at that time viewed from the ſun S, ſhe would appear in the point of the heavens marked H, and her heliocentric latitude is then F H: but if viewed from the earth in B, ſhe will appear at *g*; and her geocentric is only F*g*.

The planets Mercury and Venus, whoſe orbits are included in that of the earth, are called INFERIOR; and Mars, Jupiter, Saturn, and the Georgium Sidus, are called SUPERIOR PLANETS. The two points where the heliocentric of any planet cuts the ecliptic, are called its nodes; and that which the planet paſſes through as it goes into north latitude, is called the *aſcending* node, and is marked thus ☊; and the oppoſite to this is called the *deſcending* node, and is marked ☋. A line drawn from one node to the other is called the *line of the nodes of the planet*, which is the common ſection of the plane of the ecliptic, and that of the planet produced on each ſide to the fixed ſtars.

A motion in the heavens in the order of theſe ſigns, as from Aries to Taurus, is ſaid to be a motion in *conſequence*; and ſuch are the true motions of all the planets, though their apparent motions are ſometimes contrary, and then they are ſaid to move in *antecedence*. The local zodiac is not always invariably the ſame as to the places of the ſeveral ſigns, though the whole always takes up the ſame place in the heavens, viz. 10 degrees on each ſide the ecliptic. The points where the celeſtial equator cuts the ecliptic, are found to have a motion in antecedence of about 50 ſeconds a year.

This change of place of the firſt point of the ecliptic, from whence the ſigns are counted, occaſions a like change in the ſigns themſelves; which, though ſcarcely ſenſible for a few years, has now become very conſiderable.

The LONGITUDE of a phænomenon in the heavens is the number of degrees counted from the firſt point of aries on the ecliptic to the place where a circle of latitude drawn through the phænomenon would cut the ecliptic at right angles. Every phænomenon in the heavens, whether in the zodiac or not, is thus referred to the ecliptic by its circle of latitude, or great circle, paſſing through the phænomenon, and cutting the ecliptic at right angles; and whatever ſign the circle of latitude paſſes through, the phænomenon is ſaid to have its place in that ſign, though ever ſo far diſtant from it.

The common way of reckoning the longitude of a phænomenon is to take ♈ for the firſt point of the ecliptic, and not to number the degrees quite round that circle as a continued ſeries, but to make a new beginning at the firſt point of every ſign, and to reckon from thence only the length of 30°. When this method is made uſe of, the longitude of any phænomenon is expreſſed by ſaying it is in ſuch a degree and ſuch a minute of a ſign: and thus we may expreſs the longitude of the aſcending node of Mercury, ☿ ☊ ♉ 13° 40′; and ſo of any other. The place of a phænomenon in the heavens is expreſſed by ſetting down its longitude and latitude.

Every planet like the moon, is ſometimes in CONJUNCTION with the ſun, and ſometimes in OPPOSITION. Its conjunction is when the geocentric place of the planet is the ſame with that of the ſun; though an exact or central conjunction can only take place when the line of its nodes paſſes through the earth, and the planet itſelf is in one of its nodes at the time. It is however, in general, called a conjunction or oppoſition, when the ſame circle of latitude paſſes through the ſun and planet at the ſame time. When the geocentric place of a planet is 90°, or a quarter of a circle from the ſun's place, the planet is ſaid to be in *quadrature* or in a *quartile* aſpect with the ſun; and theſe terms are uſed in a like ſenſe when applied to any two of the heavenly bodies. Thus the ſun and moon, or the moon and any planet, or any two planets, may be in conjunction, oppoſition, or quadrature.

The inferior planets have two kinds of conjunction with the ſun; one in the inferior part of their ſemicircles, the other in the ſuperior part. In the former, the planet is between the earth and the ſun; and in the latter, the ſun is between the earth and planet. The inferior planets can never be in oppoſition to the ſun, nor even appear at a great diſtance from him. The length they go is called their *elongation*. Thus, in Plate XXII. fig. 9, let OPQRT be part of the ecliptic; S the ſun; and the three circles round him, the orbits of Mercury, Venus, and the Earth. Suppoſe the earth to be at A, the ſun's geocentric place will be at Q; ſo that he is in conjunction with the ſun in his inferior ſemicircle: if at M, his geocentric place is likewiſe at Q: ſo that he is in conjunction in his ſuperior ſemicircle.

In like manner, Venus at E is in conjunction in her inferior ſemicircle, at G in her ſuperior : but if we ſuppoſe the earth to be at A, and Venus at H, her geocentric place is T, and her elongation QT, which in this figure is the greateſt poſſible ; for this always takes place when a ſtraight line from the earth touches the orbit of the planet, as is evident from the figure ; that is, provided the planet be in its aphelion at the time. Thus the greateſt poſſible elongation of Mercury is QP when he is in his aphelion at L ; and the quantity of this is found by aſtronomical obſervations to be about 28 degrees, and that of Venus about 48. The inferior planets in their elongations are ſometimes eaſtward and ſometimes weſtward of the ſun ; in the former caſe they appear in the evening, and in the latter in the morning. The ſmallneſs of Mercury and his nearneſs to the ſun prevent him from being often taken notice of ; but the largeneſs and beauty of Venus have made her, in all ages, celebrated as the *evening* and *morning ſtar*.

The planets ſometimes appear to go forward, ſometimes backward, and ſometimes to ſtand ſtill. Theſe different conditions are by aſtronomers called *direct*, *retrograde*, and *ſtationary*. Were they to be viewed from the ſun, they would always appear direct ; but when viewed from the earth, the inferior planets appear direct while moving in their upper ſemicircles, and retrograde when in their lower ones. Thus in fig. 9, ſuppoſe the earth at reſt at A, while Mercury is going on in his orbit from N to I, and from I to L, his motion appears to an obſerver at A to be retrograde, or contrary to the order of the ſigns, namely, from R to Q and from Q to P; but when in that part of his orbit which lies between L and N, his motion appears direct, or from P to Q and from Q to R.

When the earth is in the line of nodes of an inferior planet, the apparent motion of the former is then in a ſtraight line, becauſe the plane of it paſſes through the eye : if in a conjunction in his upper ſemicircle, he paſſes behind the ſun : if in his lower ſemicircle, he paſſes before it, and will then be ſeen by an obſerver on earth to paſs over the ſun's diſk like a round and very black ſpot. Were the plane of his orbit coincident with the ecliptic, this appearance would be ſeen every year; but by reaſon of the obliquity of the two planes to each other, it is much more rare.

MERCURY, however, was ſeen in this manner Nov. 12th, 1782, at 3 h. 44′ in the afternoon ; May 4th, 1786, at 6 h. 57′ in the morning ; December 6th, 1789, at 3 h. 55′ in the afternoon: May 7th, 1799, at 2 h. 34′ in the afternoon. In like manner, VENUS ſometimes appears as a black ſpot on the ſun, but much more ſeldom than Mercury. She was thus ſeen firſt, in 1639 ; afterwards in the years 1761 and 1769 ; but will not again be viſible in this manner till the year 1874.

When the earth is out of the line of the nodes of an inferior planet, its orbit appears an ellipſis, more or leſs excentric according to the ſituation of the eye of the ſpectator. In theſe caſes, the motion of Mercury is unequal : faſter near the inferior conjunction, but moſt unequal in the inferior ſemicircle, going through the unequal ſpaces into which the ellipſis is divided. The motions of the inferior planets, both direct and retrograde, are very unequal : and this inequality proceeds not from the excentricity of their orbits, but from the projection of their orbits into long ellipſes, and is therefore a mere optical deception.

Theſe planets appear ſtationary while changing their motion from direct to retrograde, or from retrograde to direct. If the earth ſtood ſtill, the times of their appearing ſtationary would be at their greateſt elongation ; for though it be a property of the circle that a ſtraight line can only touch it in one point, yet when the circle is very large, the receſs from the tangent is not perceptible for a conſiderable time. Thus in fig. 9, ſuppoſe the earth to be at reſt in A, Venus would appear ſtationary, her geocentric place continuing at T all the while ſhe is going in her orbit from *a* to *b ;* becauſe her deviation from the viſual line A T would ſcarce be perceptible ſo near the point of contact H.

The inferior planets, therefore, to an inhabitant of the earth, appear always near the ſun; alternately going from and returning to him, ſometimes in ſtraight lines, at others in elliptical curves, firſt on one ſide and then on the other ; ſometimes ſo near as to be rendered inviſible by his ſtronger light. Sometimes, when in or near their nodes, they paſs behind the ſun in their ſuperior ſemicircles, or paſs between him and us ; in which caſe they appear like black ſpots on his diſk, as above mentioned. For the better comprehending of theſe motions, however, we have hitherto ſuppoſed the earth to ſtand ſtill in ſome part of its orbit, while they go round the ſun in theirs : but as this is not the caſe, it now remains to conſider the changes which take place in conſequence of the earth's motion.

Were the earth to ſtand ſtill in any part of its orbit, as at A, the places of conjunction, both in the ſuperior and inferior ſemicircle, as alſo of the greateſt elongation ; and conſequently, the places of direct and retrograde motion, and of the ſtations of an inferior planet, would always be in the ſame part of the heavens. Thus, in Plate XXII. fig. 9, upon this ſuppoſition, the places of Mercury's ſtations would always be the points P and R, the arc of his direct motion PR, and of his retrograde motion RP; whereas, on account of the earth's motion, the places where theſe appearances happen are continually advancing forward in the ecliptic, according to the order of the ſigns. In fig. 10, let ABCD be the orbit of the earth ; *e f g b* that of Mercury, ☉ the ſun ; GFKI an arc of the ecliptic extended to the fixed ſtars. When the earth is at A, the ſun's geocentric place is at F ; and Mercury, in order to a conjunction, muſt be in the line AF : that is, in his orbit he muſt be at *f* or *b*. Suppoſe him to be at *f*, in his inferior ſemicircle : if the earth ſtood ſtill at A, his next conjunction would be when he is in his ſuperior ſemicircles at *b ;* the places of his greateſt elongation alſo would be at *e* and *g*, and in the ecliptic at E and G : but ſuppoſing the earth to go on in its orbit from A to B, the ſun's geocentric place is now at K ; and Mercury, in order to be in conjunction, ought to be in the line BK at *m*. As by the motion of the earth, the places of Mercury's conjunctions with the ſun, are thus continually carried round in the ecliptic, in conſequence, ſo the places of his utmoſt elongations muſt be carried in conſequence alſo. Thus, when the earth is at A, the places of his greateſt elongation from the ſun are in the ecliptic E and G ; the motion of the earth from A to B advances them forward from G to L, and from E to I.

The geocentric motion of Venus may be explained in a ſimilar manner; only as the motion of Venus is much ſlower than that of Mercury, his conjunctions, oppoſitions, elongations, and ſtations, all return much more frequently than thoſe of Venus.

To explain the ſtationary appearances of the planets, it muſt be remembered, that the diameter of the earth's orbit, and even of that of Saturn, are but mere points in compariſon of the diſtance of the fixed ſtars; and, therefore, any two lines, abſolutely parallel, though drawn at the diſtance of the diameter of Saturn's orbit from each other, would, if continued to the fixed ſtars, appear to us to terminate in the ſame point. Let the two circles, Plate XXII. fig. 11, repreſent the orbits of Venus and of the Earth; let the lines AE, BF, CG, DH, be parallel to SP; we may nevertheleſs affirm, that if continued to the diſtance of the fixed ſtars, they would all terminate in the ſame point with the line SP. Suppoſe, then, Venus at E, while the earth is at A, the viſual ray, by which ſhe is ſeen, in the line AE. Suppoſe again, that, while Venus goes from E to F, the earth goes from A to B, the viſual ray, by which Venus is now ſeen, is BF, parallel to AE; and therefore, Venus will be all that time ſtationary, appearing in that point of the heavens where SP extended would terminate: the ſtation is at her changing from direct to retrograde. Again, ſuppoſe, when the Earth is at C, Venus is at G, and the viſual line CG; if, while the Earth goes from C to D, Venus goes from G to H, ſo that ſhe is ſeen in the line GH, parallel to CG, ſhe will be all that time ſtationary, appearing in the point where a line drawn from S through P would terminate. This ſtation is at her changing from retrograde to direct; and both are in her inferior ſemicircle.

An inferior planet, when in conjunction with the ſun, in its inferior ſemicircle, is ſaid to be in PERIGEE, and when in the other to be in APOGEE, on account of its different diſtances from the Earth. Their real diſtances from the Earth, when in perigee, are variable, partly owing to the excentricities of their orbits, as well as that of the Earth; and partly owing to the motions of the different bodies, by which it happens that they are in perigee, in different parts of their orbits. The leaſt poſſible diſtance is, when the perigee happens at the time that the Earth is in its perihelion, and when the planet is in its aphelion.

The difference between the earth and inferior planets, at different times, makes a conſiderable variation in their apparent diameters, which indeed, is very obſervable in all the planets; and thus, they ſometimes look conſiderably larger than at others. This difference of magnitude in Mercury, is nearly as 5½ to 1; and in Venus, no leſs than 32 to 1. Any perſon, unaſſiſted by inſtruments, may obſerve an inferior planet alternately approach nearer and nearer the ſun, until at laſt it comes into conjunction with him and then recedes farther and farther, till it is at its greateſt elongation, which will be firſt on one ſide, and then on the other: but, if we obſerve the apparent change of place, of an inferior planet, in the ſphere of the heavens, its direct motions, ſtations, and retrogradations, meaſuring its diameter frequently with the micrometer, we ſhall find, by its decreaſe at ſome times, and increaſe at others, that its diſtance from us is very conſiderably varied.

The apparent paths of Mercury and Venus as ſeen from the Earth, are looped curves.

As the ſuperior planets move in a larger orbit than the Earth, they can only be in conjunction with the ſun, when they are on that ſide oppoſite to the Earth; as, on the other hand, they are in oppoſition to him, when the earth is between the ſun and them. They are in quadrature with him, when their geocentric places are 90 degrees diſtant from the ſun.

The DIRECT MOTION of a ſuperior planet is ſwifter the nearer it is to a conjunction, and ſlower as it approaches to a quadrature with the ſun.

The RETROGRADE MOTION of a ſuperior planet is ſwifter the nearer it is to an oppoſition, and ſlower as it approaches to a quadrature with the ſun.

A ſuperior planet is in APOGEE when in conjunction with the ſun, and in PERIGEE when in oppoſition; and every one of the ſuperior planets is at its leaſt poſſible diſtance from the earth where it is in perigee and perihelion at the ſame time. Their apparent diameters are variable, according to their diſtances, like thoſe of the inferior planets; and this, as might naturally be expected, is moſt remarkable in the planet Mars, who is neareſt us. In his neareſt approach, this planet is 25 times larger than when fartheſt off, Jupiter twice and a half, and Saturn once and a half. As the times of conjunction, utmoſt elongation, direct or retrograde motion of the inferior planets, depend on the combinations of their motions in their orbits with the motion of the Earth in its orbit; any of theſe appearances will be more frequent in Mercury than in Venus, becauſe the former moves with a ſwifter motion in his orbit, and conſequently muſt more frequently paſs through thoſe places where he is in conjunction, &c.

The time in which any of the inferior planets will return into a given ſituation, may be eaſily known. Compute the diurnal heliocentric motions of Venus and of the Earth: the difference of theſe motions is the diurnal motion of Venus from the Earth, or the quantity by which Venus would be ſeen to recede from the Earth every day by a ſpectator placed in the Sun: thus the mean motion of Venus is every day about 59 minutes and 8 ſeconds; the difference is 37 minutes. Therefore, as 37 minutes is to 360 degrees, or to 21,600 minutes, ſo is one day to the time wherein Venus, having left the earth, recedes from her 360 degrees; that is, to the time wherein ſhe returns to the earth again, or the time between two conjunctions of the ſame kind.

The calculations of the times are here made according to mean or equable motions of the planets: and is therefore called a mean conjunction: but becauſe Venus and the Earth are really carried in elliptic orbits, in which their motions are ſometimes ſwifter and ſometimes ſlower, the true conjunctions may happen ſome days either ſooner or later than what theſe rules will give. The time of the true conjunction is to be computed from that of the mean conjunction in the following manner. Find by aſtronomical tables the places of Venus and the Earth in the ecliptic, from which we ſhall have the diſtance of the two as ſeen from the Sun; compute alſo for the ſame time the angular motions of theſe two planets for any given time, ſuppoſe ſix hours; the difference of theſe two motions will give the acceſs of Venus to the earth, or her receſs from it in ſix hours. As this difference is to the arc between the places of Venus and the earth at the time of a mean conjunction, ſo is ſix hours to the time between the mean conjunction and the true. This time added to, or ſubtracted from, the time of the mean conjunction, according as Venus is in antecedence or conſequence from the earth, ſhows the time of their true conjunction.

As to the conjunctions, oppoſitions, direct and retrograde motions, &c. of the ſuperior planets, they depend on the combinations of their motions with that of the earth, and are more frequent in Saturn than in Jupiter, and in Jupiter than in Mars, but moſt frequent of all in Herſchel; becauſe the ſlower the motion of the planet is, the ſooner the earth will overtake it, ſo as to have it again in any given ſituation.

Thus, ſuppoſe Saturn to be in conjunction with the ſun in ♈, if he were to ſtand ſtill for one year, then he would again be in conjunction in ♈; but as he goes on ſlowly, according to the order of the ſigns, about 12° annually, the earth muſt go through almoſt 13° more than an entire revolution; ſo that there will be almoſt a year and 13 days, between any conjunction between the Sun and Saturn, and the conjunction immediately following. As Jupiter moves in the orbit with greater velocity than Saturn, the Earth muſt have a proportionably larger ſpace added to the year; and as Mars moves ſwifter ſtill, the time betwixt any two of his conjunctions muſt be ſtill longer. The time when a ſuperior planet will return into any given ſituation, may be found by the methods already laid down for the inferior planets; and the true conjunctions, &c. may be found in the ſuperior planets as in the inferior.

SECT. II. *Of the* VELOCITY, FIGURE, MOTIONS, *&c. of the* EARTH.

The Earth is 95,173,000 miles from the ſun, and goes round in 365 days 5 hours 49 minutes, from any equinox or ſolſtice to the ſame again; but from any fixed ſtar to the ſame again, as ſeen from the ſun, in 365 days 5 hours 9 minutes; the former being the length of the tropical year, and the latter the length of the ſideral. It travels at the rate of 68,000 miles every hour; a motion, which, though upwards of 140 times ſwifter than that of a cannon ball, is little more than half as ſwift as Mercury's motion in his orbit. The earth's diameter is 7970 miles; and by turning round its axis every 24 hours from weſt to eaſt, it cauſes an apparent diurnal motion of all the heavenly bodies from eaſt to weſt. By this rapid motion of the earth on its axis, the inhabitants about the equator are carried 1042 miles every hour, while thoſe on the parallel of London are carried only about 580, beſides the 68,000 miles by the annual motion above mentioned, which is common to all places whatever.

A variety of circumſtances afford the cleareſt evidence, that the earth is of a globular figure. I. When we are at ſea on board of a ſhip, we may be out of ſight of land, when the land is near enough to be viſible, if it were not hid from our eye by the convexity of the water. II. The higher the eye, the farther will the view be extended. It is very common for ſailors from the top of the maſt of a ſhip to diſcover land or ſhips at a much greater diſtance than they can do when they ſtand upon deck. III. When we ſtand on ſhore, the higheſt part of a ſhip is viſible at the greateſt diſtance. If a ſhip is going from us out to ſea, we ſhall continue to ſee the maſt after the hull or body of the ſhip diſappears, and the top of the maſt will continue to be ſeen the longeſt. If a ſhip is coming towards us, the top of the maſt comes firſt in view, and we ſee more and more till at laſt the hull appears.

IV. Several navigators, ſuch as Ferdinand Magellan, Sir Francis Drake, Lord Anſon, Captain Cook, &c. have ſailed round the globe; not in an exact circle, the land preventing them, but by going in and out as the ſhores happened to lie. V. All the appearances in the heavens are the ſame, whether at land or ſea. VI. Eclipſes of the moon ariſe from the ſhadow of the earth, which is always circular. Although the earth preſents, during ſeveral hours, different portions of its ſurface to the moon, yet ſtill the ſhadow is round. The ſmall inequalities upon the ſurface of the earth bear no kind of proportion to its magnitude ſufficient to alter the appearance of its ſhadow.

VII. The globular figure of the earth is alſo inferred from the operation of levelling, in which it is found neceſſary, to make an allowance for the difference between the apparent and true level.

The earth's AXIS makes an angle of 23°½ with the axis of its orbit, and its poſition at any time is parallel to its poſition at any other time. Thus it points always to the ſame quarter of the heavens, throughout its annual courſe. That the earth moves round the ſun, may be proved, beyond a doubt, by the following arguments.

I. The ſun is found by the moſt accurate obſervations, to be immenſely bigger than the earth; for his diameter, as ſeen by us, ſubtends an angle of more than 30′, but it is certain, that the earth, were it ſeen *from the ſun*, would not ſubtend a greater angle than 17″. If, therefore, the ſun be formed of materials not very much rarer than the earth, (and there is no reaſon to believe, that it is much leſs denſe,) the quantity of matter in the ſun, muſt far exceed the whole maſs of matter in all the planets; and to ſuppoſe, that gravity retains all the other planets in their orbits, without affecting the earth, would be as abſurd as to ſuppoſe that, ſix cannon bullets might be projected up to different heights in the air, and that five of them ſhould fall to the ground, but that the ſixth, though neither the higheſt nor the loweſt, ſhould remain ſuſpended in the air without falling, and the earth move round it.

There is no ſuch thing in nature as a heavy body moving round a light one as its centre of motion. A pebble faſtened to a mill-ſtone by a ſtring, may, by an eaſy impulſe, be made to circulate round the mill-ſtone: but no impulſe can make a mill-ſtone circulate round a looſe pebble; for the mill-ſtone would go off, and carry the pebble along with it. The ſun is ſo very much bigger and heavier than the earth, that, if he were moved out of his place, not only the earth, but all the other planets, if they were united into one maſs, would be carried along with him as the pebble would be with the mill-ſtone.

II. The celeſtial motions become exceedingly more ſimple, and free of thoſe looped contortions which muſt be ſuppoſed in the other caſe; and which are extremely improbable and incompatible with what we know of motion.

III. If the earth revolve round the ſun, then the analogy, between the ſquares of the periodic times and the cubes of the diſtances, will obtain in all the bodies which circulate round a common centre; whereas this will not be the caſe with reſpect to the ſun and moon, if both turn round the earth.

IV. Beſides theſe, other proofs might be given; but the oſt complete proof of all, and which indeed amounts to a monſtration is, the aberration of the fixed ſtars, ariſing om the progreſſive motion of light, combined with the rth's annual motion round the ſun; a diſcovery made by r. **Bradley**, and one of the fineſt in modern aſtronomy.

By frequent obſervations of the eclipſes of Jupiter's ſatel- es, it is found, that light is about eight minutes in mov- g from the ſun to the earth. And ſince the earth de- ribes about 1 degree, or 3600″, in a day, or 1440m, in 8 inutes, it will deſcribe 20″, in its orbit; therefore the ve- city of light is to the velocity of the earth in its orbit, as dius to an arch of 20 ſeconds, or the third part of a mi- te, that is, as 1 to $\frac{\cdot 0002909}{3}$ or ·00009697, or as 10300 1. That is, the velocity of light is 10300 times greater an the velocity of the earth in its orbit. Now if AN Plate XV. fig. 12.) be the way or path of a body in free ace, as a ray of light; its apparent way on a moveable lane will be different. For it will be that which is made the compoſition of the two motions of the body and plane. hus if AN be deſcribed in any time by the body, and NF deſcribed (a point in) the plane, in the ſame time, as the lane moves forward in direction NF or AB, it leaves all e points of the fixed line AN behind it, all which will erefore ſeem to move backwards in the plane. Therefore ake ND = NF, being taken backwards or contrary to the otion of the plane; andt he body, inſtead of going to N the free ſpace, will ſeem to go to D, in the ſame time, pon the moveable plane; and therefore AD will be the ap- arent path of the body in that plane.

It will be the ſame thing, if we ſuppoſe the plane fixed, d the body to have the plane's motion communicated to , in a contrary direction, ſo as the relative motion be the me as before. Thus if the body moves from B to A, in e ſame time that it would alſo move from A to N, then that compound motion it would move along the diagonal N of the parallelogram whoſe ſides are BA, AN, and in e ſame time. Therefore rays of light emitted from a ſtar the direction AN, will fall upon the point D of the mov- g plane; that is, upon the eye of the obſerver, in the di- ction AD: and an obſerver at D will ſuppoſe the ſtar tuated in the line DA. If BN be parallel to AD, and the oint D tranſlated to N in the ſame time; an obſerver at N ill ſuppoſe the ſtar ſituated in the line BN; making the ngle BNF or ADF leſs than ANF, the angle it would ap- ear under if the plane was at reſt. So that the angle of levation BNF, above the line of direction NF, of the ob- rver, is leſs than before, being taken on the ſide F, to- ards which the obſerver moves. The obſerver, inſtead of eing the ſtar at A its real place, will ſee it at B its appa- ent place; but if the obſerver moves from F to N and D, nd B be the real place of the ſtar, its apparent place would e at A to an obſerver at N.

The apparent place B is always in the plane of aberration, rawn through the way of the obſerver NF, and the line A drawn from the obſerver to the real place of the ſtar; or AB being parallel to NF, is in the plane ADNF. The ngle BNA or NAD is the angle of aberration; by the uantity of this angle the ſtar is depreſſed, in going towards it; or raiſed in going from it. In the triangle AND; AN : ND : : S.ADN : S.NAD; and AN and ND being given; the S.NAD the aberration will be as the S.ADN. Becauſe AN is 10300 times greater than ND; the S.NAD does not differ from its arch or angle; whence, the angle of aberration NAD or ANB is always as the ſine of the angle ADN, or ANF, which are nearly equal, and which may be called the *angle of the* EARTH'S WAY. Hence the angle of aberration ANB is greateſt, when AN is perpendicular to ND; and becomes nothing, when ANF is nothing. Since AN is to ND, as radius to 20″; or ANB will be 20″, which is the greateſt it can be. In other caſes, as radius to S. angle of the earth's way ANF : : ſo 20″, to the aberration, anſwering to that angle; which angle is always taken in the plane of aberration ADNF.

The ſtrongeſt objection, that can be made againſt the earth's moving round the ſun like the other planets, is, that, in oppoſite points of the earth's orbit, its axis, which always keeps a parallel direction, would point to different fixed ſtars; which is not found to be fact. But this objection is eaſily removed, by conſidering the immenſe diſtance of the ſtars in reſpect of the diameter of the earth's orbit; the latter being no more than a point when compared to the former. If we lay a ruler on the ſide of a table, and along the edge of the ruler view the top of a ſpire at ten miles diſtance; then lay the ruler on the oppoſite ſide of the table in a parallel ſituation to what it had before, and the ſpire will ſtill appear along the edge of the ruler; becauſe our eyes, even when aſſiſted by the beſt inſtruments, are incapable of diſtinguiſhing ſo ſmall a change at ſo great a diſtance. As the apparent places of the ſtars, therefore, correſpond with this theory, the motion of the earth and the motion of light are both determined.

In fact, we find that the ſun, and thoſe planets on which there are viſible ſpots, turn round their axis: for the ſpots in general move regular over their diſks, allowing for the variations already taken notice of. Hence we may reaſonably conclude, that the other planets, on which we ſee no ſpots, and the earth, which is likewiſe a planet, have ſuch rotations. But being incapable of leaving the earth to view it at a diſtance, and its rotation being ſmooth and uniform, we can neither ſee it move on its axis as we do the planets, nor feel ourſelves affected by its motion. Yet there is one effect of ſuch motion, which will enable us to judge with certainty whether the earth revolves on its axis or not.

All globes which do not turn round their axis, will be perfect ſpheres, on account of the equality of the weight of bodies on their ſurfaces; eſpecially on the fluid parts. But all globes, which turn on their axis, will be oblate ſpheroides; that is, their ſurfaces will be higher or farther from the centre in the equatorial than in the polar regions: for, as the equatorial parts move quickeſt, they will recede fartheſt from the axis of motion, and enlarge the equatorial diameter. That our earth is really of this figure, is demonſtrable from the unequal vibrations of a pendulum, and the unequal lengths of degrees in different latitudes.—Since then, the earth is higher at the equator than at the poles, the ſea, which naturally runs downward, or toward the places which are neareſt the centre, would run towards the polar regions, and leave the equatorial parts dry, if the centrifugal force of theſe parts, by which the waters were carried thither, did not keep them from returning. The earth's equatorial diameter is 36 miles longer than its axis.

It is found that bodies near the poles are heavier than thoſe towards the equator, becauſe they are nearer the earth's centre, where the whole force of the earth's attraction is accumulated. They are alſo heavier, becauſe their centrifugal force is leſs, on account of their diurnal motion being ſlower. For both theſe reaſons, bodies carried from the poles towards the equator gradually loſe their weight. Experiments prove, that a pendulum, which vibrates ſeconds near the poles, vibrates ſlower near the equator, which ſhows that it is lighter or leſs attracted there. To make it oſcillate in the ſame time, it is found neceſſary to diminiſh its length. By comparing the different lengths of pendulums ſwinging ſeconds at the equator and at London, it is found that a pendulum muſt be $2\frac{169}{1000}$ lines (or 12th parts of an inch) ſhorter at the equator than at the poles.

A perſon on the earth can no more be ſenſible of its undiſturbed motion on its axis, than one in the cabin of a ſhip on ſmooth water can be ſenſible of the ſhip's motion, when it turns gently and uniformly round. It is therefore no argument againſt the earth's diurnal motion, that we do not feel it; nor are the apparent revolutions of the celeſtial bodies every day, a proof of the reality of theſe motions; for whether we or they revolve, the appearance is the very ſame. A perſon looking through the cabin windows of a ſhip, as ſtrongly fancies the objects on land to go round when the ſhip turns, as if they were actually in motion.

The other common objections againſt the earth's motion on its axis, are eaſily anſwered. Some imagine, that if the earth turns eaſtward, as it certainly does, if it turns at all, a ball fired perpendicularly upwards in the air, ſhould fall conſiderably weſtward of the place it was projected from. This objection will be found to have no weight, if we conſider that the gun and ball partake of the earth's motion; and therefore the ball, being carried forward with the air as quick as the earth and air turn, muſt fall down on the ſame place. A ſtone let fall from the top of a main-maſt, if it meets with no obſtacle, falls on the deck as near the foot of the maſt when the ſhip ſails as when it does not.

As for thoſe ſcriptural expreſſions which ſeem to contradict the earth's motion, this general anſwer may be made to them all, that, the ſcriptures were never intended to inſtruct us in philoſophy or aſtronomy; and therefore on thoſe ſubjects, expreſſions are not always to be taken in the literal ſenſe, but for the moſt part as accommodated to the common apprehenſions of mankind. Men of ſenſe in all ages, when not treating of the ſciences purpoſely, have uſed common language, and it would be abſurd to adopt any other in addreſſing the majority of mankind.

The annual motion of the earth has been effectually confirmed by an argument drawn from the progreſſive motion of light; and from the ſame conſideration the truth of the diurnal motion may be completely eſtabliſhed.

In conſequence of the progreſſive motion of light, the apparent place of a fixed ſtar is eaſt of its true place, and the difference is proportional to the coſine of the ſtar's declination; this diſplacement of the fixed ſtars has changed, becauſe of the proceſſion of the equinoctial points. Therefore, if the diurnal revolution of the heavens were a real motion, the whole heavens muſt have changed their appearance; and the reſpective poſitions of the ſtars muſt be very different now, from what they were in the times of Hipparchus. A ſtar which is now near the vernal equinox muſt have changed its apparent diſtance, at leaſt 5° from another ecliptical ſtar which is 60° eaſt from it. Nay it is highly probable, that no zodiacal ſtar could be ever viſible; ſuch would have been the direction that the rays of light muſt have taken, becauſe of their own proper motion being compounded with that of the ſtar, whoſe velocity muſt have been exceedingly great, by reaſon of its diſtance from the poles of the motion. But ſince no ſuch remarkable diſplacement of the ſtars has been obſerved, we may conclude, that the cauſe which would have produced it, has no exiſtence; and that the revolution of the heavens is not a *real*, but only an *apparent* motion.

The ANNUAL and DIURNAL MOTIONS of the earth, together with the different lengths of days and nights, and all the beautiful variety of ſeaſons, depending on thoſe motions may be thus illuſtrated.

In Plate XV. fig. 1, let F G H I be the earth, O its centre; and let it revolve about an axis perpendicular to the plane of the figure, in the order I F G H; that is, from weſt to eaſt. Let A be the ſun, draw A F O H C and G O I perpendicular to it; let a ſpectator be at I; then ſince the tangent at I (which repreſents the horizon) will be parallel to A F H, and A at an immenſe diſtance; they will nearly meet in A, and the ſun at A will be riſing in the horizon at I. As the earth moves round, the ſpectator is carried towards F, and the ſun at A ſeems to riſe higher and higher; and when the ſpectator is arrived at F, then the ſun is at the higheſt. As the earth ſtill turns round, and the ſpectator is carried from F towards G, the ſun appears to deſcend, as if it moved towards D; and when the ſpectator is arrived at G, then the ſun appears in the tangent at G; that is, in the horizon at G; and therefore the ſun is ſetting. Afterwards, all the time the ſpectator is moved through G H I, the ſun appears under the horizon, till it comes at I, where the ſun ſeems to riſe again.

Thus it is evident, that while the ſpectator is carried through the illuminated half of the earth I F G, it is daylight; at the middle point F, it is noon-day; at the dark hemiſphere G H I, it is night; and at H, it is midnight. And thus the viciſſitude of day and night appears, by the rotation of the earth about its axis. What has been ſaid of the ſun, is equally true of the moon, or any ſtar placed at A. And therefore all the celeſtial bodies ſeem to riſe and ſet by turns, one after another, according to their various ſituations. For let A, B, C, D, be four ſtars: when the ſpectator is at I, the ſtar A riſes; and when at G, it ſets. When the ſpectator is at F, B riſes; and when it is at H, it ſets. When he is at G, C riſes; and when at I, it ſets. When the ſpectator is at H, D riſes; and when at F, it ſets.

Hence it is the very ſame thing, as to the diurnal motions, WHETHER THE EARTH MOVES uniformly about its axis, while the HEAVENS STAND STILL; or whether the HEAVENS MOVE uniformly round, while the EARTH STANDS STILL; the phænomena being exactly the ſame either way. For whether the ſpectator moves uniformly in the arch I F, from weſt to eaſt, whilſt A is fixed; or A moves uniformly in the arch A D, from eaſt to weſt, whilſt I is fixed; the ſame angle will be deſcribed, and therefore the altitude of A, above the horizon, will be the ſame either way.

SECT. III. *Of the* SEASONS.

To explain the cauſes of the various ſeaſons, ſee Plate XV. fig. 7, and ſupply ♎ in the middle of the dark circle E N Q A. Let ♈ ♋ ♎ ♑ be the earth's orbit, and S the ſun. This orbit is ſo ſmall in reſpect to the diſtance of the fixed ſtars, that the ſame aſpect of the heavens will appear, whether a man be placed in the earth or in the ſun. If the earth be at ♈, a ſpectator will ſee the ſun in ♎; when the earth comes to ♉, he will ſee the ſun in ♏; and the ſun will appear to have moved through ♎ ♏. Whilſt the earth is moving to ♊, the ſun will ſeem to paſs through ♏ ♐; and a perſon on the earth obſerves the ſun to go through the ſame ſpace in the heavens, that a ſpectator at the ſun would ſee the earth go through: and as he is not ſenſible of the earth's motion, he aſcribes that motion to the ſun, which in reality is unmoved. Hence, becauſe the relative motion is the ſame, whether of the two is moved, and all effects are the ſame as to their places; aſtronomers generally ſuppoſe the ſun to move along the ecliptic, deſcribing its orbit round the earth at reſt.

Let N E A Q be the earth, N A be its axis, N the north pole, A the ſouth; E Q the equinoctial, and P R a parallel of latitude paſſing through any place. Draw a plane G ♈ I perpendicular to ♑ S ♋, which divides the illuminated hemiſphere from the dark one. The axis N A is inclined to the plane of the ecliptic or earth's orbit, in an angle of 66½ degrees: and during the earth's motion in its orbit, the axis always remains in a parallel poſition, or pointing to the ſame ſtar. The earth alſo moves uniformly round this axis; and deſcribes equal arches in equal times. Now let the earth be at ♎; in this poſition, the circle dividing the light and dark hemiſpheres paſſes through the poles N and A, and divides all the parallels as P R into two equal parts; therefore any point in that parallel, as the earth revolves round, will ſtay as long in the light hemiſphere as in the dark; that is, the days and nights are equal. As it moves to ♏, the pole N comes into the light hemiſphere, by reaſon of the oblique poſition of the axis N A; and as it proceeds to ♐ and ♑, the light hemiſphere reaches farther and farther beyond N, till coming to ♑, it is at the fartheſt, reaching to G, and making the arch N G 23½ degrees, the complement of N ♑ S, or 66½ degrees. Then the oppoſite pole A is as far involved in the dark hemiſphere; whence in north latitudes, or in the hemiſphere E N Q the days have been increaſing from ♎ to ♑, where they are at their longeſt; for the greater part of the parallel P R is in the illuminated hemiſphere, and the ſmaller part in the dark.

In the oppoſite or ſouthern hemiſphere the days have been decreaſing, and are at their ſhorteſt when the earth is at ♑: for all parallels to E Q have their greater part in the dark hemiſphere. If through the point G a parallel be deſcribed, this parallel is called the *arctic circle;* and all the ſpace contained therein is illuminated, and there is no night, when the earth is at ♑. For the ſame reaſon, the ſpace within a parallel drawn through I, will be all dark, and all is night there. If a parallel be drawn through B, where S ♑ cuts the arch N E, that parallel is called the *tropic of Cancer;* and the ſun will ſhine perpendicular upon the inhabitants in that parallel. This is the ſummer ſeaſon for thoſe that are in the hemiſphere E N Q, and the winter for thoſe that live in E A Q; and ſince E Q is equally divided by the circle of light and darkneſs G I, the days and nights are always equal under the equinoctial.

While the earth moves through ♒ and ♓ to ♈, the circle of light and darkneſs comes nearer and nearer to the pole N, the angle N ♑ G and conſequently B ♑ E grows leſs and leſs, till they vaniſh in ♈; then the circle of light and darkneſs paſſes again through the poles N and A, biſecting all the parallels at P R; and the days and nights are again equal, all over the earth.

While the earth moves through ♈, ♉, ♊, to ♋, the ſun ſeems to go through ♎, ♏, ♐, to ♑; and the circle ſeparating light and darkneſs falls ſhort more and more of the north pole N, and goes further and further beyond the ſouth pole A; whence the parallels cut by that circle will have the greater part in the dark, in the north hemiſphere; but in the ſouth hemiſphere, the greater part will be in the light: and it is winter to the northern hemiſphere E N Q, the days being at the ſhorteſt; and ſummer to the ſouthern hemiſphere E A Q, their days being at their longeſt.—Within the parallel drawn through G, there will be no day whilſt the earth is at ♋; and in the parallel drawn through I, there will be no night. At the pole A it will be day for ſix months, and at the pole N it will be night for ſix months; juſt the contrary of what happens when the earth is at ♑. In this poſition, if a parallel be drawn through B, the ſun will ſhine perpendicular to the earth in that parallel, and it is called the *tropic of Capricorn;* and a parallel drawn through I is called the *antarctic circle.*

When the earth moves from ♋ through ♌ and ♍ to ♎ again; it is evident the circle ſeparating light and darkneſs draws nearer and nearer to the pole N and A, by which the light and dark parts of the parallels become nearer an equality, and ſo to the days and nights. Therefore in the north hemiſphere E N Q, the days are increaſing; and in the ſouth hemiſphere they are decreaſing; and the days and nights become equal in every place, when the earth arrives at ♎.

In this manner are the ſeveral ſeaſons cauſed, being owing to the obliquity of the axis of rotation of the earth, to the plane of the earth's orbit. But if the axis was perpendicular to it, there could be no variety in the length of days, in whatever part of the orbit the earth was; and all ſeaſons would be alike. Thus the OBLIQUITY of the EARTH'S AXIS to the ECLIPTIC, or which is the ſame thing, of the EQUINOCTIAL to the ECLIPTIC, is the CAUSE of the different ſeaſons, ſummer, winter, ſpring, and autumn during the year. Without this, there could be no difference of ſeaſons; and conſequently it could not be eaſy to know the length of the year, without obſervations of the ſtars. For the length of the year is known from finding the time of obſervation, when the ſun is in the equinoctial points; and there being no ſuch points to obſerve by, there could be no method but to obſerve by the poſition of the ſtars, when the ſame ſtar was again in oppoſition to the ſun, which none but an aſtronomer could do.

The SUN appears 47 degrees HIGHER in the ſummer tropic, than it does in the winter tropic; for in ſummer it ſeems to have aſcended through the arch BE; and in winter, to have deſcended through the arch BQ equal to BE; and their ſum is 47 degrees.

All theſe phænomena may be thus repreſented: Take a ſmall globe that has the equinoctial and parallels drawn on it; and placing a candle upon a table move the globe round the candle in a circle parallel to the table, ſo that the axis of the equator may be oblique to that circle, and be kept always in a parallel poſition whilſt it moves about. The candle will illuminate the globe as it is carried round, juſt as the ſun does the earth in its orbit; and the poles and the parallels will be the ſame way affected with light and darkneſs as the globe.

The orbit of the earth being elliptical, and the ſun conſtantly keeping in its lower focus, which is 1,617,941 miles from the middle point of the longer axis, the earth approaches twice as near, or 3,235,882 miles nearer the ſun at one time of the year than at another; for the ſun appearing under a larger angle in our winter than ſummer, proves that the earth is nearer the ſun in winter. But here this queſtion naturally ariſes, Why have we not the hotteſt weather when the earth is neareſt the ſun? In anſwer it muſt be obſerved, that the excentricity of the earth's orbit, or 1,617,941 miles, bears no greater proportion to the earth's mean diſtance from the ſun, than 17 does to 1000; and therefore this ſmall difference of diſtance cannot occaſion any great difference of heat or cold.

But the principal cauſe of this difference is, that in winter the ſun's rays fall ſo obliquely upon us, that any given number of them is ſpread over a much greater portion of the earth's ſurface where we live; and each point muſt then have fewer rays than in ſummer. There comes alſo a greater degree of cold in the long winter nights than there can return of heat in ſo ſhort days; and on both theſe accounts the cold muſt increaſe. In ſummer the rays fall more perpendicularly upon us; come with greater force, and in greater numbers, on the ſame place; and by their long continuance, a much greater degree of heat is imparted by day, than can fly off by night.

Beſides, thoſe parts which are once heated, retain the heat for ſome time; which, with the additional heat daily imparted, makes it continue to increaſe though the ſun declines towards the ſouth. This is the reaſon why July is hotter than June, and often, in our cold climate, Auguſt hotter than both, although the ſun has withdrawn from the ſummer tropic; as we find it is generally hotter at three in the afternon, when the ſun has gone towards the weſt, than at noon when he is in the meridian. Thoſe places too which have been well cooled, require time to be heated again; for the ſun's rays do not heat even the ſurface of any body, till they have been ſome time upon it. Hence we find January for the moſt part colder than December, although the ſun has withdrawn from the winter tropic, and begins to dart his beams more perpendicularly upon us. An iron bar is not heated immediately upon being put into the fire, nor grows cold till ſome time after it has been taken out.

The ſun completes what is called a TROPICAL YEAR, when he arrives at the ſame equinoctial or ſolſtitial point. This he does in 365 days, 5 hours, 48 minutes, 57 ſeconds. When he arrives at the ſame fixed ſtar again, as ſeen from the earth, he completes the SIDERIAL YEAR, which contains 365 days, 6 hours, 19 minutes, 14½ ſeconds. The ſiderial year is therefore 20 minutes, 17½ ſeconds longer than the ſolar or tropical year, and 9 minutes 14½ ſeconds longer than the Julian or the civil year, which we ſtate at 365 days, 6 hours; ſo that the civil year is almoſt a mean between the ſiderial and tropical.

As the ſun deſcribes the whole ecliptic, or 360°, in a tropical year, he moves 59′ 8″ of a degree every day at a mean rate; and conſequently 50″ of a degree in 20 minutes 17½ ſeconds of time: therefore he will arrive at the ſame equinox or ſolſtice, when he is 50″ of a degree ſhort of the ſame ſtar or fixed point in the heavens, from which he ſet out the year before. So that, with reſpect to the fixed ſtars, the ſun and equinoctial points fall back (as it were) 30 degrees in 2160 years, which will make the ſtars appear to have gone 30 degrees forward with reſpect to the ſigns of the ecliptic in that time: for the ſame ſigns always keep in the ſame points of the ecliptic, without regard to the conſtellations.

The anticipation of the equinoxes, and conſequently of the ſeaſons, is not owing to the preceſſion of the equinoctial and ſolſtitial points in the heavens, (which can only affect the apparent motions, places, and declinations, of the fixed ſtars;) but to the difference between the civil and ſolar year, which is 11 minutes 3 ſeconds; the civil year containing 365 days 6 hours, and the ſolar year 365 days 5 hours 48 minutes 57 ſeconds.

Theſe 11 minutes 3 ſeconds, by which the civil or Julian year exceeds the ſolar, amount to 11 days in 1433 years; and ſo much our ſeaſons had fallen back, with reſpect to the days of the months, ſince the time of the Nicene council in A. D. 325. In order, therefore, to bring back all the faſts and feſtivals to the days then ſettled, it was requiſite to ſuppreſs 11 nominal days: and, that the ſame ſeaſons might be kept to the ſame times of the year, to leave out the biſſextile day in February at the end of every century of years not diviſible by 4; to reckon them only common years; as the 17th, 18th, and 19th centuries, viz. the years 1700, 1800, 1900, &c. becauſe a day intercalated every fourth year was too much; and to retain the biſſextile day at the end of thoſe centuries of years which are diviſible by 4, as the 16th, 20th, and 24th centuries, viz. the years 1600, 2000, 2400, &c.

Without theſe changes, the ſeaſons in length of time, would be quite reverſed with regard to the months of the year; though it would have required near 23,783 years to have brought about ſuch a total change. If the earth had made exactly 365¼ diurnal rotations on its axis, whilſt it revolved from any equinoctial or ſolſtitial point to the ſame again, the civil and ſolar years would always have kept pace together, and the STYLE would never have needed any alteration.

SECT. IV. *Of the* PHÆNOMENA *of the* MOON.

The MOON is not a primary planet, but only a ſatellite, or attendant of the earth, circulating around it in 29 days, 12 hours, and 44 minutes, and round the ſun along with it every year. The moon's diameter is 2180 miles; and her diſtance from the earth's centre is 240,000. She goes round her orbit in 27 days, 7 hours, 43 minutes, moving about 2290 miles every hour; and turns round her axis exactly in the time that ſhe goes round the earth, which is the reaſon of her keeping always the ſame ſide towards us, and that her day and night taken together is as long as our lunar month.

The moon is an opaque globe like the earth, and ſhines only by reflecting the light of the ſun: therefore, whilſt that half of her which is towards the ſun is enlightened, the other half muſt be dark and inviſible. Hence ſhe diſappears when ſhe comes between us and the ſun; becauſe her dark ſide is then towards us. When ſhe is gone a little way forward, we ſee a little of her enlightend ſide: which increaſes to our view as ſhe advances, until ſhe comes to be oppoſite to the ſun; when her whole enlightened ſide is towards the earth, and ſhe appears a round illuminated orb, which we call the FULL MOON; her dark ſide being then turned away from the earth. From the full ſhe ſeems to decreaſe gradually as ſhe goes through the other half of her courſe; ſhowing us leſs and leſs of her enlightened ſide every day, till her next change or conjunction with the ſun, when ſhe diſappears as before.

Our earth appears as *a moon* to the inhabitants of the moon; waxing and waning regularly but appearing 13 times as big, and affording them 13 times as much light, as ſhe does to us. When ſhe changes to us, the earth appears full to her; and when ſhe is in her firſt quarter to us, the earth is in its third quarter to her; and *vice verſa*. But from one half of the moon the earth is never ſeen at all: from the middle of the other half, it is always ſeen over head; turning round almoſt 30 times as quick as the moon does. From the circle which limits our view of the moon, only one half of the earth's ſide next her is ſeen; the other half being hid below the horizon of all places on that circle. To her inhabitants the earth appears the biggeſt body in the univerſe; for it appears 13 times as big as ſhe does to us.

While the earth turns round its axis, the ſeveral continents, ſeas, and iſlands, appear to the moon's inhabitants like ſo many ſpots of different forms and brightneſs, moving over its ſurface; but much fainter at ſome times than others, according as our clouds cover them. By theſe ſpots the Lunarians can determine the time of the earth's diurnal motion, juſt as we do the motion of the ſun: and they may meaſure their time by the motion of the earth's ſpots, for they cannot have a more true dial.

The axis of the moon is ſo nearly perpendicular to the ecliptic, that the ſun never removes ſenſibly from the equator; and the obliquity of her orbit, which is next to nothing as ſeen from the ſun, cannot cauſe the ſun to decline ſenſibly from her equator. Yet her inhabitants are not deſtitute of means for aſcertaining the length of their year, though their method muſt differ from ours. We know the length of our year by the return of our equinox; but the Lunarians, having always equal day and night, muſt have recourſe to another method; and we may ſuppoſe, they meaſure their year by obſerving when either of the poles of our earth begins to be enlightened, and the other to diſappear, which is always at our equinoxes: they being conveniently ſituated for obſerving great tracts of land about our earth's poles, which are entirely unknown to us. Hence we may conclude, that the year is of the ſame abſolute length to the inhabitants of the earth and moon, though very different as to the number of days; we having $365\frac{1}{4}$ natural days, and the Lunarians only $12\frac{7}{19}$, every day and night in the moon being as long as $29\frac{1}{2}$ on the earth.

The inhabitants of the moon on the ſide next the earth, may find the *longitude* of their places, as eaſily as we can find the *latitude* of ours. For the earth keeping conſtantly, or very nearly ſo, over one meridian of the moon, the eaſt or weſt diſtances of places from that meridian are as eaſily found as we can find our diſtance from the equator by the altitude of our celeſtial poles.

As the ſun only enlightens that half of the earth which is towards him, and leaves the oppoſite half in darkneſs, he does the ſame to the moon, but with this difference, that as the earth is ſurrounded by an atmoſphere, we have twilight after the ſun ſets; but if the moon has neither an atmoſphere of her own, nor is included in that of the earth, (as is ſuppoſed) the Lunarians muſt have an immediate tranſition from the brighteſt ſun-ſhine to the blackeſt darkneſs.

The moon being an opaque ſpherical body (for her hills take off no more from her roundneſs, than the inequalities on the ſurface of an orange take off from its roundneſs,) we can only ſee that part of the enlightened half, which is towards the earth. And therefore, when the moon is at A, See Plate XV. fig. 8, in conjunction with the ſun S, her dark half is towards the earth, and ſhe diſappears as at *a*, there being no light on that half to render it viſible. When ſhe comes to her *firſt octant* at B, or has gone an eighth part of her orbit from her conjunction, a quarter of her enlightened ſide is towards the earth, and ſhe appears horned, as at *b*. When ſhe has gone a quarter of her orbit from between the earth and ſun to C, ſhe ſhows us one half of her enlightened ſide, as at *c*, and we ſay, ſhe is a *quarter* old. At D, ſhe is in her *ſecond octant*; and by ſhowing us more of her enlightened ſide, ſhe appears gibbous, as at *d*. At E, her whole enlightend ſide is towards the earth; and therefore ſhe appears round, as at *e*, when we ſay it is *full moon*. In her *third octant* at F, part of her dark ſide being towards the earth, ſhe again appears gibbous, and is on the decreaſe, as at *f*. At G, we ſee juſt one half of her enlightened ſide; and ſhe appears half decreaſed, or in her third quarter, as at *g*. At H, we only ſee a quarter of her enlightened ſide, being in her *fourth octant*; when ſhe appears horned, as at *h*. And at A, having completed her courſe from the ſun to the ſun again, ſhe diſappears; and we ſay it is new moon. Thus, in going from A to E, the moon ſeems continually to increaſe; and in going from E to A, to decreaſe in the ſame proportion; having like phaſes at equal diſtances from A to E, but as ſeen from the ſun S ſhe is always full.

The moon does not appear perfectly round, when ſhe is full in the higheſt or loweſt part of her orbit, becauſe we have not a full view of her enlightened ſide at that time. When full in the higheſt part of her orbit, a ſmall deficiency appears on her lower edge; and the contrary when full in the loweſt part of her orbit.

From the figure it is evident, that when the moon changes to the earth, the earth appears full to the moon; and *vice verſa*. For when the moon is at A, new to the earth, the whole enlightened ſide of the earth is towards the moon; and when the moon is at E, full to the earth, its dark ſide is towards her. Hence a *new moon* anſwers to a *full earth*, and a *full moon* to a *new earth*. The quarters are alſo reverſed to each other.

The poſition of the moon's cuſps, or a right line touching the points of her horns, is very differently inclined to the horizon, at different hours of the ſame days of her age. Sometimes ſhe ſtands, as it were, upright on her lower horn, and then ſuch a line is perpendicular to the horizon: when this happens, ſhe is in what the aſtronomers call the *nonageſimal degree;* which is the higheſt point of the ecliptic above the horizon at that time, and is 90 degrees from both ſides of the horizon, where it is then cut by the ecliptic. But this never happens when the moon is on the meridian, except when ſhe is at the very beginning of Cancer or Capricorn.

It is eaſy to demonſtrate, that the moon turns round her axis in the time that ſhe goes round her orbit; for, a ſpectator at reſt, without the periphery of the moon's orbit, would ſee all her ſides turned regularly towards him in that time. She turns round her axis from any ſtar to the ſame ſtar again in 27 days 8 hours; from the ſun to the ſun again in 29½ days: the former is the length of her ſiderial day, and the latter the length of her ſolar day. A body moving round the ſun would have a ſolar day in every revolution, without turning on its axis; the ſame as if it had been at reſt, and the ſun moved round it: but without turning round its axis it could never have one ſiderial day, becauſe it would always keep the ſame ſide towards any particular ſtar.

If the earth had no annual motion, the moon would go round it ſo as to complete a lunation, a ſiderial, and a ſolar day, all in the ſame time. But, becauſe the earth goes forward in its orbit, while the moon goes round the earth in her orbit, the moon muſt go as much more than round her orbit, from change to change in completing a ſolar day, as the earth has gone forward in its orbit during that time, *i. e.* almoſt a twelfth part of a circle. If the earth had no annual motion, the moon's motion round the earth, and her track in open ſpace, would be always the ſame. But as the earth and moon move round the ſun, the moon's real path in the heavens is very different from her viſible path round the earth; the latter being in a progreſſive circle, and the former in a curve of different degrees of concavity; which would always be the ſame in the ſame parts of the heavens, if the moon performed a complete number of lunations in a year without any fraction.

To illuſtrate this, let the nail in the end of the axle of a chariot wheel repreſent the earth, and a pin in the nave the moon: If the body of the chariot be propped up ſo as to keep that wheel from touching the ground, and the wheel be then turned round by hand, the pin will deſcribe a circle both round the nail and in the ſpace it moves through. But if the props be taken away, the horſes put to, and the chariot driven over a piece of ground which is circularly convex; the nail in the axle will deſcribe a circular curve, and the pin in the nave will ſtill deſcribe a circle round the progreſſive nail in the axle, but not in the ſpace through which it moves. In this caſe, the curve deſcribed by the nail will reſemble in miniature as much of the earth's annual path round the ſun, as it deſcribes whilſt the moon goes as often round the earth as the pin does round the nail: and the curve deſcribed by the pin will have ſome reſemblance of the moon's path during ſo many lunations.

The ſurface of the moon being uneven, ſome are ſurpriſed that her edge does not appear jagged, as well as the curve bounding the light and dark places. But if we conſider, that what we call the *edge* of the moon's diſk is not a ſingle line ſet round with mountains, in which caſe it would appear irregularly indented, but a large zone, having many mountains lying behind one another from the obſerver's eye, we ſhall find that the mountains in ſome rows will be oppoſite to the vales in others; and thus fill up the inequalities ſo as to make her appear quite round; juſt as when one looks at an orange, although its roughneſs be very diſcernible on the ſide next the eye, eſpecially if the ſun or a candle ſhines obliquely upon that ſide, yet the line terminating the viſible part ſtill appears ſmooth and even.

SECT. V. *Of the* TIDES.

The TIDES are found to follow periodically the courſe of the ſun and moon, and hence it has been ſuſpected, in all ages, that the tides were ſomehow produced by the influence of theſe luminaries. Of this, Pliny, Ptolemy, Macrobius and others ſeem to have had ſome *knowledge*. The celebrated KEPLER formed ſome conjectures long ago, as to the true cauſe of the tides. "If, (ſays he) the earth ceaſed to attract its waters towards itſelf, all the water in the ocean would riſe and flow into the moon. The ſphere of the moon's attraction extends to our earth and draws up the water." What Kepler only ſurmiſed, has been completely verified in the theory laid down by Newton, and by Halley, from his principles. The principal phænomena of the tides are as follow:

I. The ſea is obſerved to flow for about 6 hours from ſouth to north, gradually ſwelling; and after a flux of about 6 hours, it ſeems to reſt for a quarter of an hour; and then to ebb or retire back again from north to ſouth for 6 hours more. Then after a ſeeming pauſe of about ¼ of an hour, the ſea again begins to flow; and ſo on alternately.

II. Hence the ſea ebbs and flows twice a day, but falling every day later and later, by about 48 minutes, the period of a flux and reflux being on an average about 12 h. 24 min. and the double of each 24 h. 48 min. which is the period of a lunar day, or the time between the moon's paſſing a meridian, and coming to it again. So that the ſea flows as often as the moon paſſes the meridian, both the arch above the horizon, and that below it; and ebbs as often as ſhe paſſes the horizon, both on the eaſtern and weſtern ſide. Theſe are the moſt obvious appearances: The other phænomena are as follow:

III. The elevation towards the moon exceeds the oppoſite one a little, and the quantity of the aſcent of the water is diminiſhed from the equator to the poles.

IV. The ſun raiſes and depreſſes the ſea twice every day, in the ſame manner that the moon does; but the ſolar tides are much leſs than the lunar ones, although ſubject to the ſame laws.

V. The tides which depend upon the actions of the ſun and moon. are not diſtinguiſhed, but compounded ; and thus they form to appearance, one united tide, which increaſing, and decreaſing, produces NEAP and SPRING tides.

VI. In the ſyzygies the elevations from the action of both luminaries concur, and the ſea is more elevated ; but the ſea aſcends leſs in the quadratures ; for where the water is elevated by the action of the moon, it is depreſſed by that of the ſun, and vice verſa. Therefore, while the moon paſſes from the ſyzygy to the quadrature, the daily elevations are continually diminiſhed ; on the contrary, they are increaſed, while the moon paſſes from the quadrature to the ſyzygy. At the new moon alſo *cæteris paribus* the elevations are greater ; and thoſe that follow one another the ſame day, are more different than thoſe at full moon.

VII. The greateſt elevations aud depreſſions take place on the 2d or 3d day after the new or full moon, and they are the greater, the nearer the luminaries are to the plane of equator ; being greateſt in the ſyzygies, near the equinoxes.

VIII. The actions of the ſun and moon are greater, the nearer thoſe bodies are to the earth ; and the greateſt tides happen, when the ſun is a little to the ſouth of the equator ; but this does not happen regularly every year, becauſe ſome variation may ariſe from the ſituation of the moon's orbit, and the diſtance of the ſyzygy from the equinox.

IX. The mean force of the moon, to move the ſea, is to that of the ſun nearly as 4½ to 1 ; and therefore if the action of the ſun alone produce a tide of 2 feet, which it is ſaid to do ; then that of the moon will be 9 feet, from which it follows, that the ſpring tides will be 11 feet, and the neap tides 7 feet. But ſuch elevations, as far exceed theſe, happen from the motion of the water againſt ſome obſtacles, and from the ſea violently entering ſtraits or guts, where the force is not broken till the water riſes higher.

The preceding phænomena take place in the open ſea, where the ocean is extended enough to be ſubject to theſe motions. But the particular ſituations of places, as to ſhores, capes, bays, &c. diſturb in a conſiderable degree theſe general rules. We are now to ſhow how theſe phænomena may be explained, from the principle of univerſal gravitation.

If the earth were entirely fluid and quieſcent, its particles, by their mutual gravity towards each other, would form the whole maſs into the figure of an exact ſphere. If a power were to act on all the particles of this ſphere, with an equal force, and in parallel directions, the whole maſs would be moved together, but no change would be produced on its ſpherical figure, and its centre would have the ſame motion as each particle.

Upon this hypotheſis, if the motion of the earth, round the centre of gravity of the earth and moon, were deſtroyed, and the earth left to the influence of its gravitation towards the moon, as the power above mentioned, then the earth would fall or move ſtraight towards the moon, without changing its ſpherical figure.

But the fact is, that the effects of the moon's action, as well as the action itſelf on different parts of the earth, are not equal, thoſe parts, by the general rules of gravity, being moſt attracted that are neareſt to the moon, and thoſe being leaſt attracted that are fartheſt from her, while the parts that are at a middle diſtance, are attracted by a mean degree of force ; beſides, all the parts are not acted upon in parallel lines, but in lines directed towards the centre of the moon, on both which accounts, the ſpherical figure of the fluid earth muſt ſuffer ſome change from the action of the moon, ſo that in falling, as we have ſuppoſed, the nearer parts being moſt attracted, would fall quickeſt, the farther parts being leaſt attracted, would fall ſloweſt, and the fluid maſs would be lengthened out, and take a kind of ſpheroidical form.

Hence it appears, (which muſt be carefully obſerved,) that it is not the action of the moon itſelf, but the inequalities of that action, that cauſe any variation from the ſpherical figure ; and that if this action were the ſame in all the particles, as in the central parts, and operating in the ſame direction, no ſuch change would enſue.

Let us now admit the parts of the earth to gravitate towards its centre, then as this gravitation far exceeds the action of the moon, and much more exceeds the differences of her actions on different parts of the earth, the effect which reſults from the inequalities of theſe actions of the moon, will be only a ſmall diminution of the gravity of thoſe parts of the earth, which it endeavoured in the former ſuppoſition to ſeparate from its centre ; that is, thoſe parts of the earth which are neareſt to the moon, and thoſe that are fartheſt from her, will have their gravity towards the earth ſomewhat abated, to ſay nothing of the lateral parts ; ſo that ſuppoſing the earth fluid, the columns from the centre, to the neareſt, and to the fartheſt parts muſt riſe, till, by their greater height they be able to balance the other columns, whoſe gravity is leſs altered by the inequalities of the moon's action, and thus the figure of the earth muſt ſtill be an oblong ſpheroid.

Let us now conſider the earth, inſtead of falling toward the moon by its gravity, as projected in any direction, ſo as to move round the centre of gravity of the earth and moon, it is evident, that in this caſe the ſeveral parts of the fluid earth will ſtill preſerve their relative poſition, and the figure of the earth will remain the ſame as if it fell freely towards the moon ; that is, the earth will ſtill aſſume a ſpherodical form, having its longeſt axis directed toward the moon.,

From the preceding reaſoning, it appears, that the parts of the earth directly under the moon, as at H, (Pl. XV. fig. 10,) and alſo the oppoſite parts at D, will have the flood or high water at the ſame time, while the parts at B and F, at 90° diſtance, or where the moon appears in the horizon, will then have the ebbs, or loweſt waters. Hence as the earth turns round its axis from the moon to the moon again in 24 h. 48 min. this oval of water muſt ſhift with it, and thus there will be two tides of flood, and two of ebb in that time. It farther appears, that by the motion of the earth on her axis, the moſt elevated part of the water is carried beyond the moon, in the direction of the rotation ; ſo that the water continues to riſe after it has paſſed directly under the moon, though the immediate action of the moon there begins to decreaſe ; and comes not to its greateſt elevation, till it has got about half a quad-

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rant farther. It continues to deſcend after it has paſſed at 90° from the point below the moon, to a like diſtance of half a quadrant.

The greateſt elevation, therefore, is not in the line drawn through the centres of the earth and moon, nor the loweſt points, where the moon appears in the horizon, but all theſe are removed about half a quadrant eaſtward from theſe points in the direction of the motion of rotation. Thus, in open ſeas, where the water flows freely, the moon M, is generally paſt the north and ſouth meridian, as at *p*, when the high water is at Z, and at *n*; the reaſon of which is plain, becauſe the moon acts with the ſame force after ſhe has paſſed the meridian, and thus adds to the libratory or waving motion which the water acquired, when ſhe was in the meridian.

Beſides, the tides anſwer not always to the diſtance of the moon from the meridian, at the ſame places, for the action of the ſun brings them on ſooner when the moon is in her 1ſt and 3d quarters, and keeps them back later when ſhe is in her 2d and 4th: becauſe, in the former caſe, the tide, raiſed by the ſun alone, would be earlier, than that raiſed by the moon, and in the latter caſe, later.

We have hitherto adverted only to the action of the moon, in producing the tides, but it is evident, that for the ſame reaſons, the inequality of the ſun's action, on different parts of the earth, would produce a like effect, and a like deviation from an exact ſpherical figure; ſo that, in reality, there are two tides, every natural day, from the action of the ſun, as there are in a lunar day, from the action of the moon, ſubject to the ſame laws; and the lunar tide, as has been obſerved, is ſomewhat changed by the action of the ſun, the change varying every day, on account of the inequality between the natural and lunar day.

Although the gravitation of the earth towards the ſun, is much greater than its gravitation towards the moon, yet, by reaſon of the ſun's immenſe diſtance, to which the earth's diameter bears a ſmall proportion, his action upon the ſide of the earth next to him differs but little, from that which is exerted on the ſide fartheſt from him, and it is only the inequalities in that action that produce the tide. However, the effect of the ſun is ſtill very ſenſible, but that of the moon is much more ſo; for by its proximity to the earth, there is a conſiderable inequality, both in the direction of its action, and in the intenſity of that action upon different parts of the earth.

Hence it is eaſy to ſee, that the tides muſt be greateſt at new and full moon, becauſe the actions of the ſun and moon are then exerted in the ſame directions. Theſe are called SPRING TIDES; whereas, when the ſun and moon are 90° diſtant, the action of the one luminary raiſes the tides, juſt where that of the other depreſſes them, and thus are produced what are called NEAP TIDES. Newton has calculated theſe effects of the ſun and moon reſpectively upon the tides from their attractive powers, the former he finds to be, to the force of gravity, as 1 to 12868200. And he concludes, that the force of the moon, in moving the waters, is to that of the ſun, as 4·4815 to 1.

Dr. Horſley, however, in his edition of Newton's *Principia*, eſtimates the force of the moon to that of the ſun, as 5·0469 to 1, and other authors have given different proportions; but Newton computes, from his proportion, that the moon may raiſe the waters 9 feet, 1⅓ inch, and the ſun and moon together may produce an elevation of about 11 feet. 3 inches, and about 12½ feet, when the moon is at her neareſt diſtance. Now this is found by obſervation, to be nearly the height to which the water riſes, on the coaſts of the open and deep ocean.

It muſt be obſerved, that the ſpring tides do not happen preciſely at new and full moon, nor the neap tides preciſely at the quarters, but a day or two after, becauſe, as in other caſes, ſo in this, the effect is not greateſt or leaſt, when the immediate influence of the cauſe is greateſt or leaſt, for if the actions of the ſun and moon were to ceaſe, yet the tides would continue for ſome time; as the waves of the ſea continue their motion after a ſtorm.

The different diſtances of the moon from the earth produce a ſenſible variation in the tides; and Newton has ſhewn, that they increaſe as the cubes of the diſtances decreaſe; ſo that the moon at half her diſtance, would produce a tide eight times greater. The moon deſcribes an oval round the earth; and at her neareſt diſtance, produces a tide, ſenſibly greater than at her furtheſt diſtance. Hence two great ſpring tides never ſucceed each other, at the diſtance of 14 days; for, if the moon be at her leaſt diſtance at the change, and therefore produce a great ſpring tide, ſhe will be at her greateſt diſtance at the full, and therefore, the ſpring tide will be leſs.

The ſpring tides are higheſt and the neap tides loweſt, about the time of the equinoxes; becauſe, were the ſun or moon in the pole of the world, there would be no tide; for their action would raiſe the water at the equator, or any parallel, equally round the earth: therefore, the nearer they are to the equator, the greater muſt be their effect. When the ſun and moon traverſe the equator, the tides, which are under them, will traverſe the greateſt circle, and the waters will be put into the greateſt agitation. They will alſo be the greater at theſe times, becauſe the earth is nearer to the ſun, about the beginning of March, and end of September, than in the ſummer months.

As the greateſt of the two tides, happening in every diurnal revolution of the moon, is that in which the moon is neareſt the zenith or nadir, therefore, while the ſun is in the northern ſigns, the greater of the two diurnal tides, in our climate, will be that ariſing from the moon when above the horizon; and when the ſun is in the ſouthern ſigns, the greateſt is that ariſing from the moon below the horizon. Thus, the evening tides in ſummer exceed the morning tides, and the morning tides in winter exceed the evening tides.

Such would the tides regularly be, if the earth were covered all over with the ſea, to a great depth, ſo that the waters might freely follow the influence of the ſun and moon; but, as the tides paſs over ſhoals, and run through ſtraits into bays of the ſea, their motion becomes more various, and their height depends upon a great many circumſtances. That the tides may have their full motion, the ocean, in which they are produced, ought to be at leaſt 90° extended from eaſt to weſt; becauſe that is the diſtance between the greateſt elevation, and the greateſt depreſſion produced in the waters by the moon.

Hence it appears, that it is only in the great oceans that ſuch tides as we have deſcribed can be produced, and why in the larger Pacific ocean they exceed thoſe in the Atlantic ocean.—Hence it is obvious why the tides are not ſo great in the torrid zone, between Africa and America, where the ocean is narrower, as in the intemperate zones on either ſide; and hence alſo, we ſee why the tides are ſo ſmall in iſlands, at great diſtances from the ſhores. It likewiſe appears, that the waters cannot riſe on one ſhore of the Atlantic ocean, but by deſcending on the other, ſo that at the intermediate iſlands, it muſt remain at a mean height, between its elevations on thoſe two ſhores.

The tides, that enter the mouths of rivers from the ocean, are greatly retarded in their progreſs, by the currents of the rivers. Mr. Condamine, while in South America, obſerved, that in the river Amazon, there were five high waters, and four intermediate low waters at once; and a ſimilar circumſtance takes place in the Thames.—For the tide, propagated by the moon in the German ocean, when ſhe is three hours paſt the meridian, takes 12 hours longer to come to London Bridge, ſo that when it is high water there, a new tide is already come to its height in the ocean, and in ſome intermediate place, it muſt be low water at the ſame time.

At ſeveral places, it is high water three hours before the moon comes to her meridian; but that tide, which the moon puſhes as it were before her, is only the tide oppoſite to that which was raiſed by her, when ſhe was nine hours paſt the oppoſite meridian.

There are no ſenſible tides in the Baltic, the Mediterranean, or the Black Seas; for they communicate with the ocean, by ſuch inlets, as are of ſo immenſe an extent, that they cannot ſpeedily receive and empty water enough, to raiſe or depreſs their ſurfaces ſenſibly. In the Caſpian Sea, and in lakes, &c. the moon's attraction is nearly the ſame upon all parts of their ſurface, ſo that no ſenſible ſwelling can take place in their waters.

We may alſo conclude, that by reaſon of the fluidity of the atmoſphere, it muſt have tides ſimilar to thoſe of the ocean; and hence, there will be a general current from eaſt to weſt, both of the waters of the ocean, and of the air; but the changes produced in the ſtate of the atmoſphere, from chemical cauſes, will ſo much affect the general current, as to prevent it from being perceived.

Sect. VI. *Of the* Harvest Moon.

It is remarkable, that the moon, during the week in which ſhe is full about the time of harveſt, riſes ſooner after ſun-ſetting, than ſhe does in any other full moon week throughout the year. By this means, ſhe affords an immediate ſupply of light after ſun-ſet, which is very beneficial for thoſe employed in the harveſt, and gathering the fruits of the earth. Hence this full moon is diſtinguiſhed from all others in the year, by calling it the HARVEST MOON.

To conceive the reaſon of this phænomenon, it may firſt be conſidered, that the moon is always oppoſite to the ſun, when ſhe is full, and therefore, in the harveſt months, ſhe is full in Piſces and Aries, which are oppoſite to Virgo and Libra, the ſigns occupied by the ſun about the ſame ſeaſon. Now, the ſigns Piſces and Aries riſe in a ſhorter ſpace of time than others, as is eaſily ſhewn and illuſtrated by a celeſtial globe; and the ſame thing may be conceived from this circumſtance, that in northern latitudes, the ſmalleſt angle, made by the ecliptic and horizon, is when Aries riſes, at which time Libra ſets; and it is obvious, that the ſmaller the angle contained by the ecliptic and horizon, the greater portion of the ecliptic will riſe by the earth's rotation, in a given time. Conſequently, when the moon is full in harveſt, ſhe riſes with leſs difference of time, or more immediately after ſun-ſet, than at any other ſeaſon of the year.

In our winter, the moon is in Piſces and Aries, about the time of her firſt quarter, when ſhe riſes about noon, and therefore, her riſing is not then noticed.

In ſpring, the moon is in Piſces and Aries about the time of her change, but as ſhe then gives no light, and riſes with the ſun, her riſing cannot be perceived.

In ſummer, the moon is in Piſces and Aries at the time of the laſt quarter, and then as ſhe does not riſe till midnight, her riſing uſually paſſes unobſerved.

But in autumn, the moon is in Piſces and Aries, at the times of her full, and riſes ſoon after ſun-ſet, for ſeveral evenings ſucceſſively; which makes her regular riſings very conſpicuous, at that time of the year.

All this would happen, if the moon's orbit lay in the ecliptic; but her orbit makes with the ecliptic an angle of 5° 18′ and croſſes it in two points, called her *nodes;* ſo that her riſing when in Piſces and Aries, will ſometimes not differ above an hour and 40 minutes, through a whole week; and at other times, in the ſame two ſigns ſhe will differ in a week 3½ hours, in the time of her riſing, according to the different poſitions of the nodes, with reſpect to theſe ſigns; which poſitions are always changing, becauſe the nodes go backward through the ecliptic, in 18 years, 225 days.

This reſolution of the nodes cauſes the harveſt moons to go through a whole courſe of the moſt advantageous and leaſt beneficial ſtates, with reſpect to the harveſt, every 19 years. They are leaſt beneficial at preſent, in 1796, and will be ſo, in 1797; after which, they will be moſt beneficial from that period to 1806. In 1807, they again become leaſt beneficial, and continue ſo till 1815. Their moſt advantageous period begins again in 1816, and laſts till 1825, when the oppoſite period commences, and laſts to 1834; and again they are moſt beneficial from 1835, to 1843, and ſo on.

Sect. VII. *Of the* Refraction *of* light *by the* Atmosphere.

If it were not for the atmoſphere, the rays of light that come from the heavenly bodies, and by which they are ſeen, would enter the eye in the direction of a ſtraight line joining the luminous body and the eye. But the earth being covered to a conſiderable height with an atmoſphere of unequal denſity, a ray of light falling obliquely upon its ſurface, inſtead of continuing to move forward in the ſame rectilineal direction, is bent downwards into a curve, in its future progreſs; and enters the eye in a direction differing more or leſs from its original one, according as it falls upon the atmoſphere, with a greater or leſs degree of obliquity.

This refraction of the light by the atmoſphere, produces the TWILIGHT, for while the ſun is leſs than 18° below the horizon, his rays, although prevented from reaching us directly, by reaſon of the interpoſed body of the earth; yet fall upon the ſuperior regions of the atmoſphere, and are ſo refracted and reflected by its particles, as to produce a brightneſs over the horizon, which continues through the whole night during the ſummer months, in the regions of the earth towards the poles.

The rays of light are equally refracted by the atmoſphere, whether they come from the ſun, the moon, or the ſtars; but the quantity of the refraction, and therefore the duration of the twilight, are influenced by the changes which are perpetually taking place with reſpect to the heat and cold, the moiſture and dryneſs, &c. of the atmoſphere.

PART IV.

ASTRONOMICAL OPERATIONS AND CALCULATIONS.

Sect. I. *Of* Drawing *a* Meridian Line.

Upon a plain board, ſet parallel to the horizon, deſcribe a circle ABF, as in Plate XV. fig. 16. And upon the centre, C, erect a ſtile or gnomon, exactly perpendicular to it, and ſo high, that the top of the ſhadow thereof may fall upon the circumference of the circle about the middle of the forenoon. Mark the point B exactly where the top of the ſhadow falls in the forenoon; and mark the point F where the top of the ſhadow falls on the circumference, in the middle of the afternoon. Then through the centre C, draw the line ACD, biſecting the arch BF. Then AD is the meridian required.

It is proper to draw ſeveral concentric circles, and to make obſervations with them all, that they may confirm one another. If the ſun happens to be clouded in one, it may be clear in another. It is beſt to make theſe obſervations about the ſolſtices, when the ſun does not alter his declination ſenſibly; and the ſummer ſolſtice is to be preferred.

The ſun is evidently higheſt when in the meridian; and at equal diſtances therefrom has equal altitudes. Therefore, when the diſtances DB, DF are equal, the ſhadows CB, CF will be equal, and therefore the altitudes equal. And the *vice verſa.*

II. Hang up two threads and plummets AB, CD, Plate XV. fig. 17, at a good diſtance, in veſſels of water, to keep them ſteady; of which CD is moveable towards the left and right, upon a pin C. Wait till the pole ſtar, E, and the ſtar Alioth, F, (in the great bear's rump), come into the ſame plumb line, AB, to an eye placed at I. At that inſtant (or rather before) move the thread CD alſo into the ſame line; ſo that the thread CD may hide the thread AB, and the pole ſtar E from the eye at I. Then the plane ABCD is the plane of the meridian; and where it interſects the horizontal plane, is the meridian line. And the ſame may be done with the ſtar, called Caſſiopeia's hip. To take away the ſtar's rays, look through a ſmall hole in a thin plate. This muſt be performed in a calm place.

If it is wiſhed to have a meridian drawn in ſome other place, let the threads and plummets AB, CD, remain; and hang up two others *ab*, *cd*, in the place propoſed, as in fig. 18, letting *ab* be moveable upon a pin at *a*. Then wait till any ſtar, as G, comes into the plane ABCD to the eye, at H; and at that inſtant, move the thread *ab*, till the ſame ſtar G fall in the plane *abcd*, to the eye at *h*; then *abcd* is the plane of the meridian. This is beſt done by help of an aſſiſtant. This method will in time deviate a little from the truth, occaſioned by the ſtars changing their places; but that change is very inconſiderable for ſeveral years.

III. Having a clock or watch, with minutes and ſeconds, find the northing of the ſtar Alioth, F, (fig. 17.) by the aſtronomical tables; and wait till the pole ſtar E is in a plumb line with F. At that inſtant, ſet the clock to the ſaid time of northing. And next day at 12 o'clock, draw a meridian line, by the ſhadow of a plumb line hung in the ſun. Or find the time of ſouthing of any other ſtar, as G, and the clock remaining as before, when ſhe ſhews the time of ſouthing, place the threads, *ab*, *cd*, (fig. 18,) ſo that the line G*b* may paſs through them both. Then *abcd* will be in the plane of the meridian.

Sect. II. *Of* Finding Time, *and the* Equation *of* Time.

Having drawn a meridian line as directed in laſt article, the time when the ſun, or any other celeſtial body is exactly in the meridian, may be found by a common quadrant, placing the edge of it along the line, and obſerving when the ſun or other luminary can be ſeen exactly through its two ſights, and noting exactly the time; which, ſuppoſing the luminary viewed to be the ſun, will be preciſely noon, or 12 o'clock: but as the apparent diameter of the ſun is pretty large, it ought to be known exactly when his centre is in the meridian, which will be ſome ſhort ſpace after his eaſtern limb has arrived at it, and before his weſtern limb comes thither. It will be proper, therefore, to obſerve exactly the time of the two limbs being ſeen through the ſights of the quadrant; and the half of the difference between theſe times, added to the one or ſubtracted from the other, will give the exact time when the ſun's centre is in the meridian.

The ſame method is equally applicable to the moon; but not to the ſtars, which have no ſenſible diameter. It is found, by obſervation, that the ſtars appear to go round the earth in 23 hours 56 minutes 4 ſeconds, and the ſun in 24 hours; ſo that the ſtars gain 3 minutes 56 ſeconds upon the ſun every day, which amounts to one diurnal revolution in a year; and therefore, in 365 days, as meaſured by the returns of the ſun in the meridian, there are 366 days as meaſured by the ſtars returning to it: the former are called SOLAR DAYS, and the latter SIDERIAL.

If the earth had no annual motion, but only a diurnal, any given meridian would revolve from the ſun to the ſun again, in the ſame quantity of time as from any ſtar to the ſame ſtar again; becauſe the ſun would never change his place with reſpect to the ſtars. But, as the earth advances almoſt a degree eaſtward in its orbit, in the time that it turns eaſtward round its axis, whatever ſtar paſſes over the meridian on any day with the ſun, will paſs over the ſame meridian on the next day, when the ſun is almoſt a degree ſhort of it; that is, 3 minutes 56 ſeconds ſooner. If the year contained only 360 days, as the ecliptic does 360 degrees, the ſun's apparent place, ſo far as his motion is equable, would change a degree every day; and then the ſiderial day would be juſt four minutes ſhorter than the ſolar.

As the motion of the earth round its axis is perfectly uniform and equal at all times of the year, the ſiderial days are always preciſely of an equal length; and ſo would the ſolar or natural days be, if the earth's orbit were a perfect circle, and its axis perpendicular to its orbit. But the earth's diurnal motion on an inclined axis, and its annual motion in an elliptic orbit, cauſe the ſun's apparent motion in the heavens to be unequal: for ſometimes he revolves from the meridian to the meridian again in ſomewhat leſs than 24 hours, ſhown by a well regulated clock; and at other times in ſomewhat more: ſo that the time ſhown by a good clock and a true ſun-dial is never exactly the ſame, but on the 15th of April, the 16th of June, the 31ſt of Auguſt, and the 24th of December.—The clock, if it goes equably and true all the year round, will be before the ſun from the 24th of December till the 15th of April; from that time till the 16th of June, the ſun will be before the clock: from the 16th of June till the 31ſt of Auguſt, the clock will be again before the ſun; and from thence to the 24th of December, the ſun will be faſter than the clock.

The equation of time, therefore, or difference between the time ſhown by a well regulated clock and a true ſun-dial, depending upon two cauſes, viz. the obliquity of the ecliptic, and the unequal motion of the earth in it, the united effects, reſulting from their combination, may be explained in the following manner.

Let Z ♈ z ♎, in Plate XXVI. fig. 1, be the earth; ZFRz, its axis; *abcde*, &c. the equator; ABCDE, &c. the northern half of the ecliptic from ♈ to ♎ on the ſide of the globe next the eye; the MNOP, &c. the ſouthern half on the oppoſite ſide from ♎ to ♈. Let us ſuppoſe a fictitious ſun to ſet out from ♈, at the ſame inſtant with the real ſun. Let the points at A, B, C, D, E, F, G, &c. quite round, from ♈ to ♈ again, bound equal portions of the ecliptic, gone through in equal times by the real ſun; and thoſe at *a*, *b*, *c*, *d*, *e*, *f*, *g*, &c. equal portions of the equator deſcribed in equal times by the fictitious ſun; and let Z ♈ z be the meridian.

As the real ſun moves obliquely in the ecliptic, and the fictitious ſun directly in the equator, with reſpect to the meridian; a degree, or any number of degrees, between ♈ and F on the ecliptic, muſt be nearer the meridian Z ♈ z, than a degree, or any correſponding number of degrees, on the equator from ♈ to *f*; and the more ſo, as they are the more oblique: and therefore the true ſun comes ſooner to the meridian every day, whilſt he in is the quadrant ♈ F, than the fictitious ſun does in the quadrant ♈ *f*; for which reaſon, the ſolar noon precedes noon by the clock, until the real ſun comes to F, and the fictitious to *f*; which two points, being equidiſtant from the meridian, both ſuns will come to it preciſely at noon by the clock.

While the real ſun deſcribes the ſecond quadrant of the ecliptic FGHIKL, from Cancer to ♎, he comes later to the meridian every day, than the fictitious ſun moving thro' the ſecond quadrant of the equator, from *f* to ♎; for the points at G, H, I, K, and L, being farther from the meridian, their correſponding points at *g*, *h*, *i*, *k*, and *l*, muſt be later of coming to it: and as both ſuns come at the ſame moment to the point ♎, they come to the meridian at the moment of noon by the clock.

In departing from Libra, through the third quadrant, the real ſun going through MNOPQ towards ♑ at R, and the fictitious ſun through *mnopq* towards *r*, the former comes to the meridian every day ſooner than the latter, until the real ſun comes to ♑, and the fictitious to *r*, and then they come both to the meridian at the ſame time. Laſtly, as the real ſun moves equably through STUVW, from ♑ towards ♈; and the fictitious ſun through *stuvw*, from *r* towards ♈, the former comes later every day to the meridian than the latter, until they both arrive at the point ♈, and then they make it noon at the ſame time with the clock.

We now proceed to explain the other cauſe of this difference, viz. the inequality of the ſun's apparent motion, which is ſloweſt in ſummer, when the ſun is fartheſt from the earth, and ſwifteſt in winter when he is neareſt to it.

As the real ſun moves unequably in the ecliptic, let us ſuppoſe a fictitious ſun to move equably in a circle coincident with the plane of the ecliptic. Let ABCD in Plate XXVI. fig. 2, be the ecliptic or orbit in which the real ſun moves, and the dotted circle *abcd* the imaginary orbit of the fictitious ſun: each going round in a year according the order of letters, or from weſt to eaſt. Let HIKL be the earth turning round its axis the ſame way every 24 hours; and ſuppoſe both ſuns to ſtart from A to *a*, in a right line with the plane of the meridian E H, at the ſame moment: the real ſun at A, being then at his greateſt diſtance from the earth, at which time his motion is ſloweſt; and the fictitious ſun at *a*, whoſe motion is always equable, becauſe his diſtance from the earth is ſuppoſed to be always the ſame. In the time that the meridian revolves from H to H again, according to the order of the letters HIKL, the real ſun has moved from A to F; and the fictitious with a quicker motion from *a* to *f*, through a large arc: therefore, the meridian EH will revolve ſooner from H to *b* under the real ſun at F, than from H to *k* under the fictitious ſun at *f*; and conſequently it will then be noon by the ſun-dial ſooner than by the clock.

As the real ſun moves from A towards C, the ſwiftneſs of his motion increaſes all the way to C, where it is at the quickeſt. But notwithſtanding this, the fictitious ſun gains ſo much upon the real, ſoon after his departing from A, that the increaſing velocity of the real ſun does not bring him up with the equally moving fictitious ſun, till the former comes to C, and the latter to *c*, when each has gone half round its reſpective orbit; and then being in conjunction, the meridian EH, revolving to EK, comes to both ſuns at the ſame time, and therefore it is noon by them both at the ſame moment.

But the increaſed velocity of the real ſun, now being at the quickeſt, carries him before the fictitious one; and therefore, the ſame meridian will come to the fictitious ſun ſooner than to the real: for whilſt the fictitious ſun moves from *c* to *g*, the real ſun moves through a greater arc from C to G: conſequently the point K has its noon by the clock when it comes to *k*, but not its noon by the ſun till it comes to *l*. And although the velocity of the real ſun diminiſhes all the way from C to A, and the fictitious ſun by an equable motion is ſtill coming nearer to the real ſun, yet they are not in conjunction till the one comes to A and the other to *a*, and then it is noon by them both at the ſame moment.

Thus it appears, that the ſolar noon is always later than noon by the clock, whilſt the ſun goes from C to A; ſooner, whilſt he goes from A to C; and at theſe two points the ſun and clock being equal, it is noon by them both at the ſame moment. Upon theſe principles tables for the equation of time are calculated, the one giving the difference between the ſun's true and mean motion; the other the difference between the ſun's longitude and right aſcenſion: from which the arc is calculated by addition or ſubtraction. But the calculation cannot, from the preceſſion of the equinoxes, be depended upon for a conſiderable length of time.

SECT. III. *Of* CALCULATING *the* DISTANCES, MAGNITUDES, &c. *of the* CELESTIAL BODIES.

Theſe are obtained by finding out the horizontal parallax of the body whoſe diſtance is deſired to be known; that is, the angle under which the ſemidiameter of the earth would appear provided we could ſee it from that body. In general the parallax of a planet is the difference between the real and apparent place of a planet; that is, between its place ſeen from ſome part of the ſurface, and from the centre of the earth: ſo that the parallax is the angle under which the ſemidiameter of the earth, terminated by the place of an obſerver, is ſeen at the planet; and to find this parallax many methods have been deviſed.

I. Let AD, Plate XXVI. fig. 3, be the earth, C its centre, P the planet; and let the planet's diſtance CP from the centre of the earth be given. Then ZAP is the complement of the apparent altitude, ZCP, the complement of the true altitude. As the planet's diſtance from the centre of the earth CP: to the earth's radius AC:: ſo is the conſine of the apparent altitude, S.ZAP: to the ſine of the parallax. For draw AF parallel to CP. The angle FAP is equal to the angle APC. But ZAF is equal to ZCP, the true zenith diſtance, and ZAP is the apparent zenith diſtance; and their difference FAP, or its equal APC is the parallax. But in the triangle CAP, it is CP: S.CAP or ZAP:: CA: S.CPA, or PAF, the parallax.

The PARALLAX of a PLANET being known, is DISTANCE may be found. For this is only working backward, ſaying, As ſine of the parallax, to the earth's radius; ſo S. zenith diſtance, to the planet's diſtance.

Having the parallax of ANY of the planets, the diſtances of ALL the planets from the ſun may be known, in diameters of the earth, or any ſort of meaſure. For the diſtances of the planets from the ſun and from one another, are known in ſome aſſured meaſure; and by the parallax of a planet, the true diſtance of the earth from it is known: and therefore all the other diſtances will be known by proportion.

The parallax of Venus has been determined from obſervations made at different parts of the earth, upon what is called her TRANSIT over the ſun's diſk, a phænomenon, that rarely happens; but when it does happen, it affords the beſt; and indeed the only accurate method of determining that moſt important problem in aſtronomy, THE SUN'S PARALLAX, or the angle under which the earth's ſemidiameter appears from the ſun.

The firſt tranſit, or paſſage of Venus over the ſun's diſk, that ever was obſerved, happened in 1639, but perhaps the only mortals who ſaw it were Mr. HORROX and his friend Mr. CRABTREE. Two tranſits have happened ſince; the firſt in 1761, and the laſt in 1769. There will be no more before 1874, and the next to that will happen in 1996. The two late tranſits were carefully obſerved. From the firſt of theſe Mr. SHORT has computed the ſun's parallax to be 8″. 69; and from the laſt, the beſt aſtronomers have concluded it to be 8″. 6. This is an obſervation of the greateſt conſequence, becauſe it is only by a knowledge of the ſun's diſtance from the earth, in ſome known meaſure, that we can acquire a knowledge of the true dimenſions of the ſolar ſyſtem.

As to the FIXED STARS, no method of aſcertaining their diſtance has hitherto been found out. Thoſe who have formed conjectures concerning them, have thought that they were at leaſt 400,000 times farther from us, than we are from the ſun.

Dr. HERSCHEL has propoſed a method of aſcertaining the PARALLAX of the fixed ſtars, ſomething ſimilar, but more complete, than that mentioned by GALILEO and others; for it is by the parallax of the fixed ſtars that we ſhould be able to determine their diſtance. The method pointed out by Galileo, and firſt attempted by Hooke, Flamſtead, Molineaux, and Bradley, of taking the diſtances of ſtars from the zenith that paſs very near it, has given us a much juſter idea of the immenſe diſtance of the ſtars, and furniſhed us with an approximation to the knowledge of their parallax, that is much nearear the truth than we ever had before.

But Herſchel mentions the inſufficiency of their inſtruments, which were ſimilar to the preſent zenith ſectors, the method of zenith diſtances being liable to conſiderable errors on account of refraction, the change of poſition of the earth's axis ariſing from nutation, preceſſion of the equinoxes, and other cauſes, and the abarration of light. The method of his own is by means of double ſtars; which is exempted from theſe errors, and of ſuch a nature that the annual parallax, even if it ſhould not exceed the tenth part of a ſecond, may ſtill become more viſible, and be aſcertained, at leaſt to a much greater degree of approximation than it has ever been done.

This method is capable of every improvement which the teleſcope and mechaniſm of micrometers can furniſh; but as it goes on preſumptions which can hardly lead to any firm conviction, we are not likely to gain any farther knowledge, than that the ſtars are at too great a diſtance to be ſubjected as yet to our calculations. He ſuppoſes that the ſtars are, one with another, about the ſize of the ſun; and that the difference of their apparent magnitudes is owing to their apparent diſtances; both of which ſuppoſitions being only hypothetical, it is evident that the concluſions founded on them cannot be depended on with abſolute certainty.

SECT. IV. *Of the* DIVISIONS *of the* STARRY HEAVENS.

The STARS, from their apparent various magnitudes, have been diſtributed into ſeveral claſſes, or orders. Thoſe which appear largeſt, are called STARS *of the* FIRST MAGNITUDE; the next to them in luſtre, STARS *of the* SECOND MAGNITUDE; and ſo on to the SIXTH, which are the ſmalleſt that are viſible to the bare eye. This diſtribution having been made long before the invention of teleſcopes, the ſtars which cannot be ſeen without the aſſiſtance of theſe inſtruments, are diſtinguiſhed by the names of TELESCOPIC STARS.

The ancients divided the ſtarry ſphere into particular CONSTELLATIONS, or cluſters of ſtars, according as they lay near one another, ſo as to occupy thoſe ſpaces, which the figures of different ſorts of animals or things would take up, if they were there delineated. And thoſe ſtars, which could not be brought into any particular conſtellation, were called *unformed ſtars.*

By this diviſion, the ſtars are ſo diſtinguiſhed from one another, that any particular ſtar may be readily found in the heavens, by means of a celeſtial globe; on which the conſtellations are ſo delineated, that the moſt remarkable ſtars are placed in ſuch parts of the figures, as are moſt eaſily diſtinguiſhed.

The number of the ancient conſtellations is 48, and upon our preſent globes about 70. On Senex's globes are inſerted Bayer's letters; the firſt in the Greek alphabet being put to the biggeſt ſtar in each conſtellation, the ſecond to the next, and ſo on; by which means every ſtar is as eaſily found as if a name were given to it. Thus, if the ſtar γ in the conſtellation of the ram be mentioned, every aſtronomer knows as well what ſtar is meant, as if it were pointed out to him in the heavens.

The ſtarry heavens are alſo divided into three parts: viz. I. The ZODIAC, which extends quite round the heavens; is about 16 degrees broad, ſo that it takes in the orbits of all the planets, as well as that of the moon; and along the middle of which is the *ecliptic.* II. All that region of the heavens which is on the NORTH ſide of the zodiac, containing 21 conſtellations: And, III. That on the SOUTH ſide, containing 15.

The following TABLES exhibit the names of the ancient and modern conſtellations, and the number of ſtars obſerved in each of them by different aſtronomers.

TABLE I. THE ANCIENT CONSTELLATIONS.

		NUNBER of STARS in EACH, according to			
NAMES.	ENGLISH NAMES.	*Ptolemy.*	*T. Brabe.*	*Hevelius.*	*Flamst.*
Urſa minor,	The Little Bear,	8	7	12	24
Urſa major,	The Great Bear,	35	29	73	87
Draco,	The Dragon,	31	32	40	80
Cepheus,	Cepheus,	13	4	51	35
Bootes, or Arctophilax,		23	18	52	54
Corona Borealis,	The Northern Crown,	8	8	8	21
Hercules, or Engonaſin,	Hercules kneekling,	29	28	45	113
Lyra,	The Harp,	10	11	17	21
Cygnus, or Gallina,	The Swan,	10	18	47	81
Caſſiopeia,	The Lady in her Chair,	13	26	37	55
Perſeus,	Perſeus,	29	29	46	59
Auriga,	The Waggoner,	14	9	40	66
Serpentarius, or Opiuchus,	Serpentarius,	29	15	40	74
Serpens,	The Serpent,	18	13	22	64
Sagitta,	The Arrow,	5	5	5	18
Aquila, or Vultur,	The Eagle,	15	12	23	71
Antinous,	Antinous,		3	19	
Delphinus,	The Dolphin,	10	10	14	18
Equulus, or Equi ſectio,	The Horſe's Head,	4	4	6	10
Pegaſus, or Equus,	The Flying Horſe,	20	19	38	89
Andromeda,	Andromeda,	23	23	47	66
Triangulum,	The Triangle,	4	4	12	16
Aries,	The Ram,	18	21	27	66
Taurus,	The Bull,	44	43	51	141
Gemini,	The Twins,	25	25	38	85
Cancer,	The Crab,	23	15	29	83
Leo,	The Lyon,	35	30	49	95
Coma Berenices,	Berenice's Hair,		14	21	43
Virgo,	The Virgin,	32	33	50	110
Libra, or Chelæ,	The Scales,	17	10	20	51
Scorpius,	The Scorpion,	24	10	20	44
Sagittarius,	The Archer,	31	14	22	69
Capricornus,	The Goat,	28	28	29	51
Aquarius,	The Water-bearer,	45	41	47	108
Piſces,	The Fiſhes,	38	36	39	113
Cetus,	The Whale,	22	21	45	97
Orion,	Orion,	38	42	62	78
Eridanus, or Fluvius,	Eridanus, or the River,	34	10	27	84
Lepus,	The Hare,	12	13	16	19

Names.	English Names.	Number of stars in each, according to			
		Ptolemy.	*T. Brahe.*	*Hevelius.*	*Flamst.*
Canis major,	The Great Dog,	29	13	21	31
Canis minor,	The Little Dog,	2	2	13	14
Argo Navis,	The Ship,	45	3	4	64
Hydra,	The Hydra,	27	19	31	60
Crater,	The Cup,	7	3	10	31
Corvus,	The Crow,	7	4		9
Centaurus,	The Centaur,	37			35
Lupus,	The Wolf,	19			24
Ara,	The Altar,	7			9
Corona Auſtralis,	The Southern Crown,	13			12
Piſcis Auſtralis,	The Southern Fiſh,	18			24

Table II. *The* New Southern Constellations.

Columba Noachi,	Noah's Dove,	10	Apis, or Muſca,	The Bee or Fly,	4
Robur Carolinum,	The Royal Oak,	12	Chamæleon,	The Chameleon,	10
Grus,	The Crane,	13	Triangulum Auſtralis,	The South Triangle,	5
Phœnix,	The Phœnix,	13	Piſcis volans, or Paſſer,	The Flying Fiſh,	8
Indus,	The Indian,	12	Dorado, or Xiphias,	The Sword Fiſh,	6
Pavo,	The Peacock,	14	Toucan,	The American Gooſe,	9
Apus, or Avis Indica,	The Bird of Paradiſe,	11	Hydrus,	The Water Snake,	10

Table III. Hevelius's Constellations *made out of the* unformed stars.

		Hevelius.	*Flamstead.*
Lynx,	The Lynx,	19	44
Leo minor,	The Little Lyon,		53
Aſterion and Chara,	The Greyhounds,	23	25
Cerberus,	Cerberus,	4	
Vulpecula and Anſer,	The Fox and Gooſe,	27	35
Scutum Sobieſki,	Sobieſki's Shield,	7	
Lacerta,	The Lizard,	10	16
Camelopardalus,	The Camelopard,	32	58
Monoceros,	The Unicorn,	19	31
Sextans,	The Sextant,	11	41

Sect. V. *Of* Calculating *the* periodical times, places, &c. *of the* celestial bodies; constructing astronomical tables, *and* delineating *the* phases *of the* moon.

This ſection, if treated fully, would comprehend almoſt the whole of what may be called practical astronomy. But as it is by far the moſt difficult and abſtruſe, ſo the thorough inveſtigation of it would neceſſarily lead us into very deep geometrical demonſtrations. The great labours of former aſtronomers have left little, indeed, to do in this reſpect. Tables of the motions of all the celeſtial bodies have been made long ago, the periodical times, excentricities, &c. of the planets determined; and, as we ſuppoſe, few will deſire to repeat theſe laborious operations, we ſhall here only give ſome general hints of the methods by which they have been originally accompliſhed, that the operations of the young aſtronomer, who makes uſe of tables already formed, may not be merely mechanical.

It has been already obſerved, that the foundation of all aſtronomical operations is the drawing a meridian line. This being done, the next thing is, to find out the latitude of the place where the obſervations are to be made, and for which the meridian line is drawn. Now, the latitude of a place is equal to the elevation either of the north or ſouth pole above the horizon; but as there is no ſtar exactly in either of the celeſtial poles, to find the altitude of that inviſible point, called the pole *of the heavens*, we muſt chooſe ſome ſtar near it, which does not ſet; and, having found its greateſt and leaſt altitudes, divide their difference by two; and half that difference, added to the leaſt, or ſubtracted from the greateſt, altitude of the ſtar, gives the exact altitude of the pole, or latitude of the place. Thus, ſuppoſe the greateſt altitude of the ſtar obſerved is 60°, and its leaſt 50°, we then know, that the latitude of the place, where the obſervation was made, is exactly 55°.

Having found the latitude, the obliquity *of the* ecliptic, or the angle made by the ſun's annual path, with the earth's equator, is eaſily obtained by the following method. Obſerve, about the ſummer ſolſtice, the ſun's meridian diſtance from the zenith, which is eaſily done by a quadrant, with a moveable index, furniſhed with ſights; if this diſtance is ſubtracted from the latitude of the place, provided the ſun is nearer the eqnator than the place of obſervation, the remainder will be the obliquity of the ecliptic: but, if the place of obſervation is nearer the equator than the ſun at that time, the zenith diſtance muſt be added. By this method, the obliquity of the ecliptic hath been determined to be 23° 29′.

Here it is proper to obſerve, that, the obliquity of the ecliptic to the equinoctial, is found, at preſent, to be above the third part of a degree leſs than Ptolemy found it. And moſt of the obſervers after him, found it to decreaſe gradually, down to Tycho Brahe's time. If it be objected, that we cannot depend on the obſervations of the ancients, becauſe of the incorrectneſs of their inſtruments, we have to anſwer, that both Brahe and Flamſtead are allowed to have been very good obſervers; and yet we find, that Flamſtead makes this obliquity 2½ minutes of a degree leſs than Brahe did, about 100 years before him; and as Ptolemy was 1324 years before Tycho Brahe, ſo the gradual decreaſe anſwer nearly to the difference of time between theſe three aſtronomers. If we conſider, that the earth is not a perfect ſphere, but an oblate ſpheroid, having its axis ſhorter than its equatorial diameter; and that the ſun and moon are conſtantly acting obliquely, upon the greater quantity of matter, about the equator, pulling it, as it were, towards a nearer and nearer coincidence with the ecliptic; it will not appear improbable, that theſe actions ſhould gradually diminiſh the angle between thoſe planes. Nor is it leſs probable, that the mutual attractions of all the planets, ſhould have a tendency to bring their orbits to a coincidence: but this change is too ſmall to become obſervable in many ages.

The DECLINATION of the SUN from the equator, for any day, may be found, by the ſame method by which we find the obliquity of the ecliptic: and thus, a table of his declination for every day in the year, might be conſtructed: Thus, alſo, the declination of the ſun, his right aſcenſion, and place in the ecliptic, may be geometrically found, by the ſolution of a caſe, in ſpherical trigonometry. For let EQ, in Plate XXVI. fig. 8, repreſent the celeſtial equator, *y* the ſun, and *y*X the ecliptic; then, in the right angled ſpherical triangle EC*y*, we have the ſide E*y*, equal to the ſun's declination: the angle EC*y* is always 23° 29′, being the angle of the ecliptic with the equator; and the angle *y*EC is 90°, or a right angle. From theſe data, we can find the ſide EC, the right aſcenſion; and C*y*, the ſun's place in the ecliptic, or his diſtance from the equinoctial point; and thus, a table of the ſun's place, for every day in the year, anſwerable to his declination, may be formed.

The RIGHT ASCENSION of the STARS may be found by the ſun's place in the ecliptic, and a good pendulum clock: for which purpoſe, the motion of the clock muſt be ſo adjuſted, that the hand may run through the 24 hours, in the time that a ſtar, leaving the meridian, will arrive at it again; which time is ſomewhat ſhorter than the natural day, becauſe of the ſpace the ſun moves through in the mean time eaſtward. The clock being thus adjuſted, when the ſun is in the meridian, fix the hand to the point, from whence we are to begin to reckon our time; and then obſerve when the ſtar comes to the meridian, and mark the hour and minutes deſcribed by the index, turned into degrees and minutes of the equator, will give the difference between the right aſcenſion of the ſun and ſtars; which difference, being added to the right aſcenſion of the ſun, will give the right aſcenſion of the ſtar.

If we know the right aſcenſion of any ONE ſtar, we may from it, find the right aſcenſions of ALL the others, which we ſee, by marking the time upon the clock, between the arrival of a ſtar, whoſe right aſcenſion we know to the meridian, and another ſtar, whoſe aſcenſion is to be found. This time, converted into hours and minutes of the equator, will give the difference of right aſcenſions; from whence, by addition, we collect the right aſcenſion of the ſtar which was to be found out.

When the right aſcenſion and declination of a ſtar is found, its longitude and latitude, or diſtance from the firſt ſtar of Aries, and north or ſouth from the eliptic, may thence be eaſily found; and the places of the fixed ſtars being all marked in a catalogue, according to their longitudes and latitudes, it may thence be conceived, how the longitude and latitude of a planet or comet may be found for any particular time, by comparing its diſtance from them, and its apparent path may thus be traced; and thus, the paths of Mercury and Venus were traced by M. Caſſini.

To find out the PERIODICAL TIMES of the PLANETS, we muſt obſerve when they have no latitude. At that time the planet is in the ecliptic, and conſequently, in one of its nodes; ſo that, by waiting till it returns to the ſame node again, and keeping an exact account of the time, the periodical time of its revolution round the ſun, may be known pretty exactly. By ſimilar obſervations, from the theory of the earth's motions, we can find the poſition of the line of the nodes; and when once the poſition of the line is found, the angle of inclination, of the planet's orbit to the earth may alſo be known.

The EXCENTRICITY of the EARTH'S ORBIT may be determined, by obſerving the apparent diameters of the ſun at different times; when the ſun's diameter is leaſt, the earth is at the greateſt diſtance; and, when this diameter is greateſt, the earth is at its leaſt diſtance from him. But, as this method muſt neceſſarily be precarious, another is recommended by Keil, by obſerving the velocity of the earth in its orbit, or the apparent velocity of the ſun, which is demonſtrated to be always reciprocally as the ſquare of the diſtance.

The excentricities of the orbits of the other planets may be likewiſe found, by obſerving their velocities at different times; for all of them obſerve the ſame proportions, with regard to the increaſe or decreaſe of their velocity, that the earth does; only, in this caſe, care muſt be taken, to obſerve the *real*, not the *apparent*, velocities of the planets, the laſt depending on the motion of the earth at the ſame time. Their aphelia, or points of their orbits, where they are fartheſt from the ſun, may be known, by making ſeveral obſervations of their diſtances from him, and thus perceiving, when their diſtances ceaſe to increaſe.

The poſition of the aphelion being determined, the planet's diſtance from it, at any time, may alſo be found by obſervation, which is called its *true*, or *coequated* anomaly; but, by ſuppoſing the motion of the planet to be regular and uniform, tables of that motion may eaſily be conſtructed. From thence, the planet's mean place in its orbit, may be found for any moment of time; and one of theſe moments being fixed upon, as an epocha or beginning of the table, it is eaſy to underſtand, that from thence, tables of the planets place in its orbit, for any number of years, either preceding, or conſequent to that period, may be conſtructed.

ASTRONOMICAL TABLES are to be conſtructed, according to the meridian of equal time, and not true or apparent time, becauſe of the inequalities of the earth's motion, as well as that of the planet, and equations muſt be made, to be added to, or ſubtracted from, the mean motion of the planet, as occaſion requires; which will be readily underſtood, from what we have already mentioned, concerning the unequal motion of the earth, in its orbit. When all the neceſſary tables are conſtructed, by this or ſimilar methods, the calculating of the planetary places becomes a mere mechanical operation, and conſiſts only in the additions and ſubtractions, according to the directions given along with ſuch tables. But it muſt be obſerved, that the accidental interference of the planets with one another, by their mutual attractions, renders it impoſſible to conſtruct any tables, that ſhall remain equally perfect: and therefore, frequent actual obſervations and corrections of the tables will be neceſſary. This diſturbance, however, is inconſiderable, except in Jupiter and Saturn, and they are in conjunction only at a diſtant period.

The above rules, with regard to the planets, are alſo applicable to the moon; but with more difficulty, on account of the greater inequalities of her motions. From theſe irregularities, it may well be concluded, that the calculation of the moon's place in her orbit, is a very difficult matter; and indeed, before NEWTON, aſtronomers in vain laboured to ſubject the lunar irregularities to any rule. By his labours, however, and thoſe of other aſtronomers, theſe difficalties are in a great meaſure overcome; and calculations, with regard to this luminary, may be made, with as great certainty, as concerning any other. Her periodical time may be determined from the obſervation of two lunar eclipſes, at as great a diſtance from one anosher as poſſible: for, in the middle of every lunar eclipſe, the moon is exactly in oppoſition to the ſun.

Compute the time between theſe two eclipſes or oppoſitions, and divide this by the number of lunations that have intervened, and the quotient will be the ſynodical month, or time the moon takes to paſs from one conjunction to another, or from one oppoſition to another. Compute the ſun's mean motion in the time of the ſynodical month, and add this to the entire circle deſcribed by the moon. Then, as that ſum is to 360°, ſo is the quanrity of the ſynodical month to the periodical, or time that the moon takes to move from one point of her orbit to the ſame point again.

Thus COPERNICUS in the year 1500, Nov. 6th, at two hours 20 minutes, obſerved an eclipſe of the moon at Rome; and Auguſt 1ſt, 1523, at four hours 25 minutes, another at Cracow; hence the quantity of the ſynodical month is thus determined:

	Y.	D.	H.	M.	
Obſerv. 2d	1523	237	4	25	
Obſerv. 1ſt	1500	310	2	20	
Interval of time,	22	292	2	5	
Add the intercalary days for leap years,		5			
Exact interval,	22	297	2	5,	or 11,991,1005′

This interval divided by 282, the number of months elapſed in that time, gives 29 days 12 hours 41 minutes for the length of the ſynodical month. But from the obſervations of two other eclipſes, the ſame author more accurately determined the quantity of the ſynodical month to be 29 degrees 11 hours 45 minutes 3 ſeconds; from whence the mean periodical time of the moon comes to 27 days 7 honrs 43 minutes 5 ſeconds, which exactly agrees with the obſervations of later aſtronomers.

When the quantity of the periodical month is found, we may find the moon's diurnal and horary motion; and thus may tables of the moon's mean motion be conſtructed: and if from the moon's mean diurnal motion that of the ſun be ſubtracted, the remainder will be the moon's mean diurnal motion from the ſun.

Having found the moon's diſtance from the ſun, her phaſis for that time may be eaſily delineated by the following method laid down by Keil: Let the circle COBP, Pl. XV. fig. 19, & 20, repreſent the diſk of the moon, which is turned towards the earth; and let OP be cut by the diameter BC at right angles; and making LP the radius, take LF equal to the coſine of the elongation of the moon from the ſun: and then upon BC, as the great axis, and LF the leſſer axis, deſcribe the ſemi-ellipſe BFC. This ellipſe will cut off from the diſk of the moon the portion BFCP of the illuminated face, which is viſible to us from the earth.

As the moon in the middle of a total eclipſe, is exactly in the node, if the ſun's place be found for that time, and ſix ſigns added to it, the ſum will give the place of the node, provided the eclipſe be lunar; but if ſolar, the place of the node and the ſun are the ſame. From comparing two eclipſes together, the mean motion of the nodes will thus be found. The apogee of the moon may be known from her apparent diameter, and by comparing her place when in the apogee at different times, the motion of the apogee itſelf may alſo be determined.

SECT. VI. PRELIMINARY OBSERVATIONS *reſpecting* ECLIPSES.

Before we lay down rules for calculating eclipſes it is neceſſary, to make a few general obſervations reſpecting their nature and cauſes. All the planets and ſatellites being illuminated by the ſun, caſt their ſhadow towards that point of the heavens which is oppoſite to the ſun. This ſhadow is nothing but a privation of light, in the ſpace hid from the ſun by the opaque body that intercepts his rays. When the ſun's light is intercepted by the moon, ſo that he appears covered in whole, or in part, to any place of the earth, he is ſaid to *undergo an* ECLIPSE; though, properly ſpeaking, it is only an eclipſe of that part of the earth where the moon's ſhadow or penumbra falls. When the earth comes between the ſun and moon, the moon falls into the earth's ſhadow; and having no light of her own, ſhe ſuffers a real and total eclipſe from the interception of the ſun's rays. When the ſun is eclipſed to us, the moon's inhabitants, on the ſide next the earth, ſee her ſhadow like a dark ſpot travelling over the earth, about twice as faſt as its equatorial parts move, and the ſame way as they move. When the moon is in an eclipſe, the ſun appears eclipſed to her inhabitants; totally to all thoſe parts on which the earth's ſhadow falls, and of as long continuance as they are in the ſhadow.

Although all opaque bodies, on which the ſun ſhines, have their ſhadows, yet ſuch are the diſtances of the planets, and the ſize of the ſun, that the primary planets can never eclipſe one another. A primary can eclipſe only its ſecondary, or be eclipſed by it; and never but when in oppoſition or conjunction with the ſun. The primary planets are very ſeldom in theſe poſitions, but the ſun and moon are ſo every month: whence one may imagine, that theſe two luminaries ſhould be eclipſed every month. But there are few eclipſes in reſpect to the number of new and full moons; the reaſon of which we ſhall now explain.

If the moon's orbit were coincident with the plane of the ecliptic, in which the earth always moves and the ſun appears to move, the moon's ſhadow would fall upon the earth at every change, and eclipſe the ſun to ſome parts of the earth. In like manner, the moon would go through the middle of the earth's ſhadow, and be eclipſed at every full; but with this difference, that ſhe would be totally darkened for above an hour and an half; whereas the ſun never was above four minutes totally eclipſed to us by the interpoſition of the moon. But one half of the moon's orbit is elevated $5\frac{1}{3}$ degrees above the ecliptic, and the other half as much depreſſed below it; and when the ſun and moon are more than 17 degrees from either of the nodes at the time of conjunction, the moon is then generally too high or too low in her orbit to caſt any part of her ſhadow upon the earth: when the ſun is more than 12° from either of the nodes at the time of full moon, the moon is generally too high or too low in her orbit to go through any part of the earth's ſhadow: and in both theſe caſes there will be no eclipſe.

But when the moon is leſs than 17° from either node at the time of conjunction, her ſhadow or penumbra falls more or leſs upon the earth, as ſhe is more or leſs within its limit. And when ſhe is leſs than 12° from either node at the time of oppoſition, ſhe goes through a greater or leſs portion of the earth's ſhadow, as ſhe is more or leſs within this limit. Her orbit contains 360°; of which 17°, the limit of ſolar eclipſes on either ſide of the nodes, and 12°, the limit of lunar eclipſes, are but ſmall portions: and as the ſun commonly paſſes by the nodes but twice in a year, it is no wonder that we have ſo many new and full moons without eclipſes.

To illuſtrate this, let ABCD, Plate XXVI. fig. 9, be the ecliptic, RSTU a circle lying in the ſame plane with the ecliptic, and VXYW the moon's orbit, all thrown into an oblique view, which gives them an elliptical ſhape to the eye. One half of the moon's orbit, as VWX, is always below the ecliptic, and the other half XYV above it. The points V and X, where the moon's orbit interſects the circle RSTU, which lies even with the ecliptic, are the moon's nodes; and a right line XEV, drawn from one to the other, through the earth's centre, is the line of the nodes which is carried almoſt parallel to itſelf round the ſun in a year. If the moon moved round the earth in the orbit RSTU, which is coincident with the plane of the ecliptic, her ſhadow would fall upon the earth every time ſhe is in conjunction with the ſun, and at every oppoſition ſhe would go through the earth's ſhadow; and thus the ſun would be eclipſed at every change, and the moon at every full.

But although the moon's ſhadow N muſt fall upon the earth at *a* when the earth is at E, and the moon in conjunction with the ſun at *i*, becauſe ſhe is then very near one of her nodes; and at her oppoſition *n* ſhe muſt go through the earth's ſhadow I, becauſe ſhe is then near the other node; yet, in the time that ſhe goes round the earth to her next change, according to the order of XYVW, the earth advances from E to *e*, according to the order of EFGH; and the line of nodes VEX, being carried nearly parallel to itſelf, brings the point *f* of the moon's orbit in conjunction with the ſun at that next change. The moon being then at *f*, is too high above the ecliptic to caſt her ſhadow on the earth; and as the earth is ſtill moving forward, the moon at her next oppoſition will be at *g*, too far below the ecliptic to go through any part of the earth's ſhadow; for by that time the point *g* will be at a conſiderable diſtance from the earth as ſeen from the ſun.

When the earth comes to F, the moon in conjunction with the ſun Z is not at *k* in a plane coincident with the ecliptic, but above it at Y in the higheſt part of her orbit; and then the point *b* of her ſhadow O goes far above the earth; as in fig. 10, which gives an edge view of fig. 9. The moon, at her next oppoſition, is not at *o*, but at W, where the earth's ſhadow goes far above her, as in fig. 10. In both theſe caſes, the line of the nodes is about 90° from the ſun, and both luminaries are as far as poſſible from the limits of the eclipſes. When the earth has gone half round the ecliptic, and from E to G, the line of the nodes VGX is nearly, if not exactly, directed towards the ſun at Z; and then the new moon *l*, caſts her ſhadow P on the earth G; and the full moon *p* goes through the earth's ſhadow L; which brings on eclipſes again, as when the earth was at E. When the earth comes to H, the new moon falls not at *m* in a plane coincident with the ecliptic CD, but at W in her orbit below it; and then her ſhadow Q (ſee fig. 10,) goes far below the earth. At the next full ſhe is not at *q* (fig 9,) but at Y in her orbit $5\frac{1}{3}$ degrees above *q*, and at her greateſt height above the ecliptic CD; being then as far as poſſible, at any oppoſition, from the earth's ſhadow M, as in fig. 10.

Thus when the earth is at E and G, the moon is about her nodes at new and full, and in her greateſt north and ſouth declination (or latitude as it is generally called) from the ecliptic at her quarters; but when the earth is at F or H, the moon is in her greateſt north and ſouth declination from the ecliptic at new and full, and in the nodes about her quarters. The point X, where the moon's orbit croſſes the ecliptic, is called the ASCENDING NODE, becauſe the moon aſcends from it above the ecliptic; and the oppoſite point of interſection V is called the DESCENDING NODE, becauſe the moon deſcends from it below the ecliptic.

When the moon is at Y in the higheſt point of her orbit, ſhe is in her greateſt north latitude; and when ſhe is at W in the loweſt point of her orbit, ſhe is in her greateſt ſouth latitude. If the line of the nodes, like the earth's axis, was carried parallel to itſelf round the ſun, there would be juſt half a year between the conjunction of the ſun and nodes. But the nodes ſhift backwards, or contrary to the earth's annual motion, $19\frac{1}{3}$ deg. every year; and therefore the ſame node comes round the ſun 19 days ſooner every year than on the year before. Conſequently, from the time that the aſcending node X (when the earth is at E) paſſes by the ſun as ſeen from the earth, it is only 173 days (not half a year) till the deſcending node V paſſes by him.

Therefore in whatever time of the year we have eclipſes of the luminaries about either node, we may be ſure that in 173 days afterward we ſhall have eclipſes about the other node. And when at any time of the year the line of the nodes is in the ſituation VGX, at the ſame time next year it will be in the ſituation *r*G*s*; the aſcending node having gone backward, that is, contrary to the order of ſigns, from X to *s*, and the deſcending node from V to *r*; each 19⅓ degrees.

At this rate, the nodes ſhift through all the ſigns and degrees of the ecliptic in 18 years and 225 days; in which time there would always be a regular period of eclipſes, if any complete number of lunations were finiſhed without a fraction. But this never happens: for if both the ſun and moon ſhould ſtart from a line of conjunction with either of the nodes in any point of the ecliptic, the ſun would perform 18 annual revolutions and 222 degrees over and above, and the moon 230 lunations and 85 degrees of the 231ſt by the time the node came round to the ſame point of the ecliptic again; ſo that the ſun would then be 138 degrees from the node, and the moon 85 degrees from the ſun. But in 223 mean lunations, after the ſun, moon, and nodes, have been once in a line of conjunction, they return ſo nearly to the ſame ſtate again, as that the ſame node, which was in conjunction with the ſun and moon at the beginning of the firſt of theſe lunations, will be within 28′ 12″ of a degree of a line of conjunction with the ſun and moon again, when the laſt of theſe luminaries is completed. And therefore in that time there will be a regular period of eclipſes, or return of the ſame eclipſe, for many ages.

In this period, (which was firſt diſcovered by the Chaldeans,) there are 18 Julian years 11 days 7 hours 43 minutes 20 ſeconds, when the laſt day of February in leap-years is four times included; but when it is five times included, the period conſiſts of only 18 years 10 days 7 hours 43 minutes 20 ſeconds. Conſequently, if it be the mean time of any eclipſe, either of the ſun or moon, you add 18 Julian years 11 days 7 houre 43 minutes 20 ſeconds, when the laſt days in February in leap-years comes in four times, or a day leſs when it comes in five times, you will have the mean time of the return of the ſame eclipſe. But the falling back of the line of conjunctions or oppoſitions of the ſun and moon 28′ 12″ with reſpect to the line of the nodes in every period, will wear it out in proceſs of time; and after that, it will not return again in leſs than 12,492 years.

Theſe eclipſes of the ſun, will happen about the aſcending node, and begin to come in at the north pole of the earth, will go a little ſoutherly at each return, till they go quite off the earth at the ſouth pole; and thoſe which happen about the deſcending node, and begin to come in at the ſouth pole of the earth, will go a little northerly at each return, till at laſt they quite leave the earth at the north pole.

SECT. VII. *Of* CALCULATING ECLIPSES.

The chief things to be conſidered, in the calculation of eclipſes, are, the MAGNITUDES of the SHADOW and PENUMBRA of the opaque body, and the ECLIPTICAL LIMITS, or the diſtance from the NODE, when an eclipſe of the ſun or moon will happen. Theſe muſt be calculated both for lunar and ſolar eclipſes. The operations may be performed as follows.

I. *For* LUNAR ECLIPSES.

In Plate XXVI. Fig. 11. Let AB be the ſun, and CD the earth. Draw AC, BD, by the edges of the ſun and earth, which will meet in a point V, becauſe the ſun is bigger than the earth. Through the centres of the ſun and earth S and T, draw, STV. Alſo draw BCE, ADF, touching the contrary ſides of the ſun and earth, interſecting in P; alſo draw SC and CT. If the whole figure be turned round, about the axis SV, the lines AV, BV, APF, BPE, will generate the two cones CVD, EPF; the cone CVD, is the dark ſhadow of the earth, EPF continued, is the penumbral cone. And beyond V, the ſection of the cone EPF, will be all in the penumbra.

Hence, I. *Half the angle* of the *cone* of the *earth's ſhadow* CVT, is equal to the ſun's apparent ſemidiameter, leſs his horizontal parallax. For in the triangle SCV, the external angle $SCA=CVS+CST$. And CST is the ſun's parallax. Therefore $CVT=SCA-CST$.

II. Half of the angle of the *earth's penumbral cone* CPT, is equal to the ſun's ſemidiameter and his horizontal parallax. For in the triangle CSP, the external angle $CPT=PCS+CST$.

III. Hence half the angle of the earth's penumbral cone CPT, is equal to half the angle of the dark cone $CVT+$ twice the ſun's horizontal parallax CST.

IV. The apparent ſemidiameter of the earth's dark ſhadow IX, upon the moon's orbit, is equal to the ſum of the horizontal parallaxes of the ſun and moon, leſs the ſun's apparent ſemidiameter. For the angle $VCI=CIT+CVI=CIT-SCA+CST$.

V. The apparent ſemidiameter of the earth's penumbra, GI, upon the moon's orbit, is equal to the ſum of the horizontal parallaxes of the ſun and moon+the ſun's apparent ſemidiameter. For in the triangle PCI, the external angle $ECI=CIT+CPT=CIT+PCS+CST$.

VI. Hence to find the LENGTH of the EARTH'S SHADOW. In the triangle CTV there is given the angle V=ſun's apparent ſemidiameter—his parallax, and CT the earth's radius, to find TV.

II. *For the* SHADOW *and* PENUMBRA, *in* SOLAR ECLIPSES.

In Plate XXVI. Fig. 12. Let AB be the ſun, KL the moon, CD the earth. Draw the tangents AK, BL, by the edges of the ſun and moon, on the ſame ſide, to meet in V; and BKG, ALH to touch the contrary ſides. Draw SK, IK; and through S and I the centres of the ſun and moon, draw the axis SIV. Then if the whole figure AKVLB be turned about the axis SV, the ſides AV, BV, and PH, PG, will generate two cones KVL, GPH. The cone KVL is the dark ſhadow of the moon, and the cone GPH is the moon's penumbral cone. Hence,

I. The angle of the cone of the moon's ſhadow KLV, the angle of the penumbral cone KPL, the angles GKV, and HLV, are each equal to the ſun's apparent diameter AKB, very nearly, and half the angle of either cone P or V is equal to the ſun's ſemidiameter. For by reaſon of the great diſtance of the ſun from T, in reſpect of TP, TV, TI; the apparent diameter of the ſun, ſeen from any of the places, V, T, I, P, K, will be the ſame, that is, the angles AVB or KVL, APB or KPL, AKB or GKV, ALB or VLH are all equal; differing only by the angle KSI, which in the moon is inſenſible.

II. The height of the cone IP is equal to the cone VI. And KPL, KVL, are equal and ſimilar. For the angles at P and V are equal; and KL is common.

III. The apparent ſemidiameter of the moon's dark ſhadow QO, upon the earth at O, ſeen from the moon, is equal to the moon's apparent ſemidiameter—the ſun's apparent ſemidiameter. And if the ſun's apparent ſemidiameter be greater, the ſhadow does not reach the earth. For draw KO; then in the triangle KOV, VKO=KOS—KVS=KOI—AVS=KOI—½, the ſun's apparent diameter.

IV. The apparent ſemidiameter of the moon's penumbra GO, upon the ſurface of the earth, as ſeen from the moon, is equal to the ſum of the apparent ſemidiameters of the ſun and moon. Draw GI and TGR. Then in the triangle GPI, the external angle GIO=GPI+PGI=KPI+KGI=KPI+KOI=AKS+KOI.

V. Hence to find the LENGTH IV of the MOON'S SHADOW. In the triangle KVI, there is given the angle KVI=half the ſun's apparent diameter, and KI the earth's radius; whence VI will be had; and to find the arch QN of the earth involved in the moon's dark ſhadow. In the triangle QVT, we have given TV the difference between the moon's diſtance from the earth, and the height of the ſhadow; and the angle QVO=the ſun's apparent diameter, and TQ the radius of the earth; to find the angle TQV, to which add QVT, and the ſum is the angle QTO or arch QO; and doubled gives the whole arch QN.

VI. To find the ARCH of the EARTH GH involved in the PENUMBRA; Say, as the earth's radius GT: to S. of the ſun's apparent ſemidiameter : : ſo is PT the ſum of the moon's diſtance and cone's height : to S. TGP or RGK. From this take the ſun's apparent ſemidiameter, and there remains GTO=GO, which doubled gives GH. For in the triangle GPT, there is given the angle P=the ſun's apparent ſemidiameter, and PT the moon's diſtance and height of the cone, and TG the earth's radius; to find the angle RGK=GPT+PTG. Therefore PTG or OTG=RGK—GPT=RGK—the ſun's apparent ſemidiameter.

III. To FIND *the* ECLIPTICAL LIMITS.

An ECLIPSIS of the MOON can only happen, when the diſtance of the centres of the moon, and of the earth's penumbra, is leſs than the ſum of their ſemidiameters. For if the diſtance is greater, the moon and penumbra cannot touch one another.

An ECLIPSE of the SUN cannot happen, unleſs the diſtance of the centres of the ſun and moon, be leſs than the ſum of their ſemidiameters; when ſeen from a certain place. That it ſhall appear in no place, the moon's parallax muſt be added to the ſum of the ſemidiameters.

In lunar eclipſes, therefore, the moon's latitude muſt be leſs than the ſum of the ſemidiameters of the moon and of the earth's penumbral ſhadow, taken at the moon's orbit. And in ſolar eclipſes, the moon's latitude muſt be leſs than the ſum of the ſun's and moon's ſemidiameters, added to the moon's horizontal parallax; that the eclipſe may be viſible ſome way: Or without the parallax, to be viſible in a certain place.

Therefore in the right angled ſpherical triangle, Plate XXVI, fig. 13, ☊ SM, having the angle ☊, and the diſtance SM, the diſtance of the ſun from the node ☊ S will be known, or the ecliptic limits. The mode of finding which, may be ſeen from the following

EXAMPLE.

		′	″
Mean apparent ſemidiameter of the *Sun*		16	4
Parallax of the Sun - -			12
Mean apparent ſemidiameter of the *Moon* -		15	38
Parallax of the moon - - - -		59	5
Inclination of the moon's orbit - -	5	8	30
Hence will be obtained.			
The ſemidiameter of the earth's penumbra	1	13	21
The ſemidiam. of the moon and earth's ſhadows		56	51
The ſemidiam. of the Sun and Moon -		31	42
The ſame with the parallax - -	1	28	47

In the triangle ☊ SM for the eclipſe of the moon.

Here SM=1° 13′ 21″ + 15′ 38″ = 1° 28′ 59″.

S. ☊ =5 8½ - - 8.952398
S.S.M=1 28 59 - - 8.413067
Radius - - - 10.

S. ☊ S=16 47 - - - - 9.460669

the limit for the lunar eclipſe at a medium.

In the triangle ☊ SM for the eclipſe of the Sun.

Here SM ☊ = 1° 28′ 47″ - - -
S. ☊ = 5 8½ - - 8.952398
S.SM = 1 23 47 - 8.412009
Radius - - - - - 10.

S. ☊ S.=16 45 45 - - - 9.459611

the limit for the ſolar eclipſe, in any place; about the ſame as for the lunar. But for a particular place, SM=31 42; and S ☊ comes out only 5° 54′ for the limit.

Hence there will at leaſt be FOUR ECLIPSES in a YEAR, taking one year with another; two of the MOON and two of the SUN. For 16° 47′ + 16° 45′ = 33° 32′ or 33½°. Therefore the ſun ſtays above a month within the ecliptic limits, twice in the year. During which time the moon makes two revolutions, and therefore muſt cauſe two eclipſes, either time; one of the moon, and another of the ſun.

HALF of the ECLIPSES will, in general, be INVISIBLE at at any given place. And conſequently one year with another there can only be TWO VISIBLE ECLIPSES in a year, the one *lunar* and the other *ſolar*. For the ſun and moon ſpend as much time below the horizon as above it.

III. The ECLIPTICAL LIMITS may be found for TOTAL ECLIPSES, as well as for PARTIAL ones, by the ſame method: *i. e.* by taking SM=the difference of the ſemidiameters of the earth's dark ſhadow and of the moon, in lunar eclipſes; or=the difference of the ſemidiameters of the moon and ſun, in ſolar eclipſes.

IV. ECLIPSES do not happen always in the SAME PLACES of the zodiac; but in places *more and more weſtward.* For the eclipſes being about the nodes, and the nodes regreſſive at the rate of 19 degrees in a year; the places of the eclipſes are 19 degrees more weſt every ſucceeding year.

From theſe premiſes, it will be neceſſary, in calculating a *particular eclipſe*, to conſider the ANGLE that the moon's way makes with the ſun at the time of an eclipſe. See Plate XXVI, fig. 14. Let ☊ S be the ecliptic, ☊ M the moon's orbit, ☊ the node. And let S be the ſun, in the ſolar eclipſe; to the centre of the earth's ſhadow, in the lunar; and M the moon at the time of the ſyzygy. Take ☊ A to ☊ S as the ſun's horary motion, to the moon's, at that time; draw MA, then MAS is the angle required; and AM the moon's apparent orbit.

For by conſtruction, in the time that the moon has been moving from ☊ to M (that is, through ☊ S reckoned in the ecliptic,) the ſun has moved through a ſpace DS equal to ☊ A. Therefore the ſun was in D, when the moon was in the node at ☊. Draw DB, MB parallel to SM, SD; and draw B ☊, which will be parallel to MA. Now ſince the moon makes the ſame latitude DB or SM, in the ſame time, whether the ſun moves or ſtands ſtill. And ſince SM is her latitude, when the ſun is at S, DB (equal to SM) will be her latitude, ſuppoſing the ſun had ſtood at D, without any motion towards S; and conſequently ☊ B will be her apparent way, to an eye at D, through which ſhe ſeems to move in the ſame time. Or, which is the ſame thing, A M will be her apparent way to an eye fixed at S. For the triangles AMS and ☊ BD are equal; and MAS is the angle of her way with the ecliptic. By the theory of relative motions, in bodies moving the ſame way, all the apparent motions are the ſame, as if one body ſtood ſtill and the other moved forward, with the difference of their motions, ſuppoſing S to be fixed.

Hence, as the moon's horary motion : to the ſun's horary motion : : S ☊ the diſtance from the node to A ☊. Then SA = S ☊ — A ☊. As ſine of SA : rad : : tangent moon's latitude SM : tangent angle A.

It is the *apparent orbit* AM that muſt be made uſe of, in calculating *all the particulars of an eclipſe.* For an obſerver conſiders not S as moving; and therefore only the relative motions are concerned. To calculate, therefore, an eclipſe of the moon, the follywing rules will be found uſeful.

IV. RULES *for* CALCULATING LUNAR ECLIPSES.

I. Find the true time of the oppoſition, when an eclipſe is to happen; and let that be reduced to apparent time.

II. Find the true places of the ſun and moon, when in oppoſition: 2. The ſun's mean anomaly, and the place of his apogee: 3. The place of the moon's aſcending node, and of her apogee, and her latitude.

III. Let ☊ S, fig. 2, Plate XXV, be a part of the ecliptic; ☊ M the moon's orbit; S the centre of the earth's ſhadow, and M the moon, when in oppoſition. Take ☊ A, to ☊ S which is known by calculation; as the ſun's horary motion, to the moon's; which are known from the aſtronomical tables. Draw AM, for the way of the moon from the ſun. Then in the right angled ſpherical triangle ASM, there is given AS (= ☊ S — ☊ A); and SM the moon's latitude found by calculation; to find the angle SMA.

IV. Let fall SP perpendicular to AM. Then ſince the arches SM, MP, SP, are very ſmall, they may be taken for right lines; and the triangle SMP for a plane triangle. Then having SM and angle SMP; MP and SP will be found. Where P is the place of the moon in the middle of the eclipſe. Likewiſe the time of the moon's moving through MP will be known by her horary motion; and from thence the time when ſhe is at P, or the middle of the eclipſe.

V. From the aſtronomical tables, find the ſun and moon's apparent ſemidiameters, for the time of oppoſition; and their horizontal parallaxes.

VI. From any convenient ſcale of equal parts, with the centre P and radius PB, equal to the minutes contained in the moon's radius, deſcribe the circle BC*o* for the moon. And with the radius SD (equal to the ſum of the ſun and moon's horizontal parallaxes — the ſun's ſemidiameter, all in minutes), deſcribe the circle DEB, from the centre S, then this circle will repreſent the earth's dark ſhadow. Likewiſe with the ſame centre S, and radius SF (equal to the ſum of the ſun and moon's parallaxes + the ſun's ſemidiameter, in minutes), deſcribe the circle FQG; and this will be the earth's penumbra.

VII. Theſe rules being obſerved, it will be eaſy to find all the requiſites by ſcale and compaſſes, by meaſuring them; or rather by calculation, in the ſeveral right-angled plain triangles, contained in the ſcheme. Thus, to find when the moon firſt touches the penumbra at L; in the right angled triangle SPK, there is given SP, and SK (the ſum of the radii SL and PB), to find PK. Which being known, the time of the moon's paſſing through it will be known, by the moon's horary motion from the ſun.

To find when the moon firſt enters the dark ſhadow of the earth in D: In the right angled triangle SPI, there is given SP, and SI (the ſum of the radii SD, PB) to find PI; and conſequently the time of half the duration in the ſhadow.

To find the digits or 12th parts of the moon eclipſed. Here *no* the part eclipſed is $= Sn + Po - SP$; and $\frac{12no}{2Po}$ or $\frac{6no}{Po}$ is the number of digits eclipſed. In TOTAL ECLIPSES of the moon, the earth's ſhadow often reaches further than the moon. And then more than 12 digits are ſaid to be eclipſed, ſuppoſing the moon's diſk to be produced ſo far.

To find the time when the moon wholly enters into the dark ſhadow BED, follow the ſame method as when it entered into the penumbra GQF. This will be evident, by ſuppoſing GQL the dark ſhadow. In that caſe SI will be the difference of the ſemidiameters of the moon and dark ſhadow. The times of paſſing through PI, PK, &c. being known, and the time of the middle of the eclipſe at P; the *beginning* and *ending* will be known.

VIII. Hence, if the moon or circle CB*o*, never touches the circle GQF, there will be no eclipſe, not even by the penumbra. And if the ſame circle never touches the circle BDE, there will be no part of the moon totally eclipſed. And if the whole circle CB*o* enter into the circle BED, the whole moon will be totally eclipſed; and that is when SP is leſs than the difference of the ſemidiameters SD and PB. If the point S be in the node, then P falls upon S, and the eclipſe is central. When only a part of the circle CB*o* goes into the circle BED, the eclipſe is a partial one, as in this figure.

IX. The time of the eclipſe being known for any particular place, it is eaſy to know if it be viſible at that place; by knowing if the moon be riſen. Or the place will be known where the moon is vertical, and therefore it will be viſible to all places, within a quadrant's diſtance from it.

X. If the ſpectator live in the place (or in the ſame longitude) which the tables are calculated for; he will ſee the eclipſe at the time determined by the calculation. If not, he will ſee it an hour ſooner for every 15° difference of longitude, that he lives weſt from it. And ſo much later, if he lives eaſtward; that is, in the way of reckoning time. But in regard to abſolute time, it is ſeen from all places at the ſame inſtant.

Exam. *To* find *the* time *of the* Lunar Eclipse, *Dec.* 13, 1769; *its* Duration *and* Digits eclipsed.

1. The mean time of the ſyzygies, by the tables, is found to be Dec. 12*d.* 19*h.* 27*m.* at which time the moon's horary motion from the ſun is 35*m.* 33*s.* At this time, computing the true places of the ſun and moon, the moon will appear to be 35′ 10″ before the ſun. And therefore the time is paſt the ſyzygy, 59*m.* 12*s.* Therefore,

From	1*d.*	19*h.*	27*m.*	0*s.*
Take	0	0	59	12
True time	1	18	27	48

The places being computed again, the moon is only 7″ before the ſun, which amounts to 12*s.* of time; therefore the time of oppoſition is 12*d.* 18*h.* 27*m.* 36*s.* which reduced to apparent time is Dec. 12*d.* 18*h.* 32*m.* 51*s.*

2. The ſun's place is	8s	21°	37′	35″
The moon's place	2	21	37	35
Place of the aſcending node	8	14	40	13
Her latitude ſouth			37	58
The ſun's horary motion			2	33
The moon's horary motion			38	6

3. Hence the moon is 6° 51′ 22″ paſt the deſcending node; that is ☋ S is 6° 51′ 22″. Therefore ☋ A = 27′ 32″, and AS = 6° 23′ 50″. Therefore the angle SMA = 84° 22′ 28″.

Hence drawing the ecliptic RS, and SM perpendicular to it, and equal to 37*m.* 58*s.* from a ſcale of minutes, as in Fig. 3, Plate XXV, and making the angle SMA = 84° 22′½. We find the perpendicular SP = 37*m.* 47*s.* and MP = 3*m.* 43*s.* And therefore, the horary motion of the moon from the ſun being 35*m.* 33*s.* PM will be paſſed over in 6*m.* 17*s.* And ſince this is before the oppoſition at M, this time muſt be deducted from the time of oppoſition. And the time of the middle of the eclipſe will be Dec. 12*d.* 18*h.* 26*m.* 34*s.*

5. The ſun's apparent ſemidiameter	16′	20″
His horizontal parallax		12
The moon's apparent ſemidiameter	16	48
Her horizontal parallax	61	7

6. Hence the radius BP = 16′ 48″.
radius SD = 44 59.
radius SF = 77 39.

7. Hence alſo PK or P*k* = 86′ 34″.
PI or P*i* = 48 53

and therefore the time of paſſing through PK is 2*h.* 26*m.* 6*s.* and through PI = 1*h* 22*m.* 30*s.* And the whole duration in the ſhadow from I to *i*, is 2*h.* 45*m.* And the digits eclipſed 8½ on the upper ſide. Whence,

Firſt ent. the penumbra Dec.	13*d* 4*h*	0*m*	28*s*	morn.
Entering the dark ſhadow at	5	4	5	
Middle	6	26	34	
Oppoſition	6	22	51	
Leaving the ſhadow	7	49	4	
Leaving the penumbra	8	52	40	
Duration	2	45	0	
Digits eclipſed 8½.				

All theſe calculations may be made ſufficiently near, by ſcale and compaſſes, in a large draught; making uſe of a ſcale of minutes and ſixtieth parts; or rather by making a ſcale of time anſwering thereto, by the help of the horary motion of the moon from the ſun. For by this ſcale, the ſeveral hours and minutes may be marked along the line A*k*, by which it will appear at what time the centre of the moon is at any given point. For the time is known when the moon is at M, and from thence the points at each hour and minute are eaſily found. And this conſtruction, with only right lines and circles, will be exact enough in a large ſcheme: for the beſt lunar tables give the times of the phaſes of the eclipſe no nearer than to four or five minutes of time; and therefore ſuch a conſtruction is ſufficient to anſwer the purpoſe. Hence it may be obſerved that no eclipſe of the moon can laſt above 5½ hours, from the moon's firſt touching the earth's penumbra, to its laſt leaving it. For SK = 94*m* 27*s* = 94.45 and the horary motion is 35*m* 33*s* = 35.55 and $\frac{94.45}{35.55}$ = 2.66 = 2h 39*m* = ſemiduration; and no eclipſe of the moon, by the earth's ſhadow, can laſt above 3¾ hours. Nor when total, above 1¾ hours. For SI = 61*m* 47*s* = 61.78, and $\frac{61.78}{35.55}$ = 1.745 = 1*m* 45*s* = the ſemiduration and SD — SI = 28*m* 11*s* = 28.18, and $\frac{28.18}{35.55}$ = .79 = 47*m*, the ſemiduration.

The refraction of the earth's atmoſphere, in lunar eclipſes, makes the ſhadow leſs; by bringing the rays, which terminate the ſhadow, ſooner to a point. And hence comes that red colour of the moon even in total eclipſes. But that light muſt be very dim, by reaſon a great number of the rays are ſtopt and loſt in the earth's atmoſphere.

The circles terminating the ſhadow and the penumbra BED and GQF, cannot be diſtinguiſhed. For the darkneſs from BED, diminiſhes by inſenſible degrees, to GQF, being darkeſt at E, and lighteſt at Q, where it vaniſhes inſenſibly. And therefore the moon does not appear to be eclipſed, till ſhe is a good way within the penumbra. For that reaſon, there may happen eclipſes of the moon which cannot be diſcovered as ſuch.

All lunar tables ſhew the moon's place in eclipſes, more truly in the ſyzygies than in the quadratures, or any other place. For the times of the ſyzygies, and the moon's place, have been more accurately obſerved in eclipſes, than at any other time; and from thence the moon's theory has been deduced. Beſides, many of the inequalities ceaſe in the ſyzygies, but have ſenſible effects in other places; becoming greater, as the moon is further from the ſyzygies; being greateſt in the quadratures. Whence the lunar tables do not determine the moon's place truly in the quadratures. And her place calculated from theſe tables is not ſo exact in the quadratures as in the ſyzygies.

Several inequalities depend on the aſpect of the nodes and the ſun; but theſe ceaſe when the nodes are in the ſyzygies. When the moon and the nodes are in the ſyzygies; the moon's place, then wanting fewer equations, as being ſubject to fewer inequalities, will be more correct, than when ſhe is in other places, where there are more and greater inequalities, and more equations; which equations have never been truly fixed. From hence more errors will happen out of the ſyzygies than in them.

V. *To* FIND *the* WAY *of the* MOON *from the* SUN, *in a* SOLAR ECLIPSE, *ſuppoſing the* OBSERVER *at* REST.

Let HZO, in Pl. XXVII. fig. 2, be the meridian of the place, HO the horizon, EC the equinoctial, EL the ecliptic, Z the zenith, P the pole, and M the places of the ſun and moon in conjunction, PSD the ſun's meridian. Having found the ſun's diſtance from the node, ☊ S, and the moon's latitude SM, &c. take ☊ A to ☊ S, as the ſun's horary motion, to the moon's horary motion; than SA is known. Draw MA; then in the ſpherical triangle ASM, right-angled at S, there is given SA, SM; to find the angle SMA; AM being the moon's way from the ſun.

But, as the eye of the obſerver is in motion, by the rotation of the earth; which gives an apparent motion to the moon, contrary to that of the obſerver; we muſt find the quantity and direction of that motion. As the obſerver is carried eaſtward, towards the point C, the apparent motion in the moon cauſed thereby will be in the line CS. And to determine the poſition of CS in reſpect of AM or SM, ſeveral ſpherical triangles muſt be reſolved, as follows.

In the right-angled triangle EDS, there is given ES and angle E to find DS and angle ESD or ASP; or theſe may be eaſier had from the aſtronomical tables. And in the triangle ZPS, there is given PS (the complement of DS,) the angle ZPS (from the time of the day,) and ZP the complement of the latitude; to find ZS, and angles PZS and ZSP. Then ZSP and ASP being known, ZSA will be known. And MSA being a right angle, ZSM will be known. In the right angled triangle CFS, there is given CF, the meaſure of the angle FZC (the difference between the angle PZS and the right angle CZP,) and SF the complement of ZS; to find CS, and the angle CSF or BSZ. Then BSZ and ZSM being known, BSM will be known. And SMA being known, its ſupplement SMB is known, and conſequently the angle SBM.

To find the quantity of the motion. That along AM is already known; and to find the apparent motion along SB. The ſine of 15° (the horary motion of a point in the equinoctial) is .259 to the radius 1. And if *b* be the moon's horizontal parallax, then the radius of the earth appears at the moon under the angle *b*, and therefore 15° of the equinoctial appears under the angle of 259*b*; this then is the horary motion of a point in the equinoctial, viewed directly from the moon. And the moon's apparent motion ſeen from that point in the equinoctial is the very ſame. But this motion is to be diminiſhed upon two accounts. 1. Becauſe it is leſs in a parallel circle, in proportion to the coſine of the latitude. And 2. Upon account of the obliquity of the motion, when not perpendicular to the rays of the ſun; and this will be as the ſine of CS, the ſun's diſtance from the eaſt or weſt point of the horizon. Therefore to find the quantity of this motion.

To the logarithm of .259*b*
Add the coſine latitude
And the ſine of CS.

Then the ſum, abating twice radius, is the logarithm of this apparent horary motion. Then this motion is to be compounded with the motion along AMB as follows.

Let AS, PLATE XXVII. fig. 3, be a portion of the ecliptic, SB the way of the apparent motion, MA the moon's way from the ſun. Draw NM parallel to SB; and let MN be the horary motion along SB or MN, and MI the horary motion of the moon from the ſun. Then complete the parallelogram NMIQ; draw the diagonal MQR, which is the direction of the motion, compounded of the obſervers and the moon's motions, and MQ is the total apparent horary motion, ſuppoſing the obſerver at reſt. Then in the plain triangle QMI, there is given MI, and IQ (or MN,) and the angle MIQ=MBS; to find the angle QMI, and and ſide MQ or the abſolute horary motion. And the angles QMI and IMS being known, QMS is known.

If the ſun be in the eaſtern hemiſphere, in which caſe the concave ſide of the eaſtern hemiſphere is here projected (in fig. 2.) then the moon's motion from the ſun is from M towards A, and the other apparent motion from S towards B, or from M towards N. But if the ſun is in the weſtern hemiſphere, this projection repreſents the convex ſide of the ſphere; and then the moon moves from the ſun, in direction AM, and the other apparent motion is from S toward C, being contrary.

VI. *To* CALCULATE SOLAR ECLIPSES.

The eclipſes of the ſun are more difficult to calculate, than thoſe of the moon; the latter being clear of parallaxes, which the former are incumbered with, which gives a great deal of trouble. But a great part of it may be avoided by uſing *projections* inſtead of calculations. The rules are,

I. Find the true time of the conjunction, and the places of the ſun and moon at that time.

II. Having found the way of the moon from the ſun by projection or calculation; find, by the aſtronomical tables, the moon's horizontal parallax, her apparent diameter, and horary motion; alſo the ſun's apparent diameter, and horary motion. But, to avoid a great deal of calculation, if the ſphere be projected by a large ſcale, it will give all the requiſites with ſufficient exactneſs, by meaſuring the ſeveral angles and ſides, without any calculation, or very little. And here it is beſt to project the concave ſide, and then every thing appears as it is in nature.

III. Find the moon's parallax of altitude, by making as rad : coſ. altitude : : ſo the moon's horizontal parallax to her parallax of altitude V*t* or M*m*. fig. 4. Then find her parallax of latitude *Mn*, and longitude *Ss*, or *mn*, and from thence her apparent latitude and longitude is known.

IV. Draw the line SL, fig. 5. for the ecliptic, and from a large ſcale of minutes, erect SM perp. to LS, and equal to the apparent latitude; make the angle SMR, as found in the laſt prob. and draw ☊ MR for the moon's apparent path. From S let fall SP perpendicular to MR, and SP will be the leaſt diſtance of the centres of the ſun and moon, or the middle of the eclipſe. From the centre S with the radius equal to the minutes contained in the ſun's ſemidiameter, deſcribe the circle ABC for the ſun. And from the centre P, with the radius equal to the moon's ſemidiameter, deſcribe the circle AOCD for the moon. If theſe circles do not interſect, there will be no eclipſe. But if they interſect, an eclipſe muſt neceſſarily happen.

V. Then P is the place of the moon in the middle of the eclipſe. Make SI and SK equal to the ſum of the ſemidiameters of the ſun and moon; and the moon's centre will be at I when the moon firſt touches the ſun, or at the beginning of the eclipſe. And K the place of the moon's centre, at the end of it. In the triangle PSI, there is given SI, SP; to find PI=PK, which reduced to time, by help of the moon's apparent horary motion, ſhews half the duration of the eclipſe; and conſequently we ſhall have the beginning and end.

VI. And to find the quantity *no*, or ;he digitis eclipſed; we have $no = Sn + Po - SP$, and $\frac{6no}{Po}$ = number of digits.

VII. The time found being mean time, it muſt be reduced to the common or apparent time, by the equation of time. And if the given place be not that for which the tables are made, add ſo much time, if the place lie eaſtward to the time of conjunction, as anſwers to the difference of meridians; or ſubtract it, if it lie weſtward.

Example.

To FIND *the* TIME *of the* SUN'S ECLIPSE, *June* 4, 1769, *its* DURATION *and* DIGITS ECLIPSED *at* LONDON.

1. By the tables the mean time of the conjunction is found to be June 3*d*. 20*h*. 41*m*. And hence the true time of conjunction is June 3*d*. 20*h*. 27*m*. 43″. and their places are 2*s*. 13° 51′ 25″. And the moon's lat. 55 32 north. The moon's motion from the ſun 35′ 47″.

2. In fig. 2 and 3, Plate XXVII, the angle AMS=84° 27′. ZSM=35° 20′. CSF=5° 18′. SBM=43° 49′. SF=42° 16′, CF=3° 34′. CS=42° 24′. The angle QMI=8° 25′. SMQ=92° 52′. MN or IQ=60 38′. MQ=31° 20.′ Alſo

The moon's horizontal parallax	60′	58″
Her apparent diameter -	33	32
Her horary motion - -	38	10
The ſun's diameter - -	31	41
His horary motion - -	2	23

In fig. 4, the moon's parallax in altitude M*m*, is 45*m*. 09*s*.; her parallax in latitude M*n*, 38*m*. 05*s*.; her remaining latitude S*n*, 17*m*. 26*s*.; her parallax in longitude S*s*, 24*m*. 13*s*.; which is increaſed ſo much.

4. Draw SL for the ecliptic, as in fig. 5; at any point S, erect the perp. MS equal to 17*m*. 26*s*. the moon's apparent latitude; through M draw the moon's way ☊ MR, making the angle SMR=92° 52*m*. Draw SP perp. MR, which here falls very near M. From the centre S, with the radius SA=15*m*. 50*s*. deſcribe the circle ABC for the ſun. And with the radius MD=16*m*. 46*s*. and centre P, deſcribe the circle ADCO for the moon.

5. Hence PI PK=27*m*. 33*s*. And the time of moving through IP or PK, at the rate of 31*m*. 20*s*. an hour, is 52*m*. 45*s*. for the ſemiduration. By reaſon of the parallax (24*m*. 13*s*.) ſhe is paſt the apparent conjunction; the difference being what the parallax cauſes, which comes to 46*m*. 23*s*. Therefore the middle of the eclipſe is ſo much ſooner, being at 3*d*. 19*h*. 41*m*. 20*s*. This reduced to apparent time is 3*d*. 19*h*. 43*m*. 27*s*. for the middle.

6. The digits eclipſed are $5\frac{4}{10}$, nearly.

In this example, the concave ſide of the ſphere is projected, which ſuits beſt to the appearance of the heavens. And the figures are drawn upon that ſuppoſition. It appears from the proceſs, that the moon is advancing to her deſcending node, and therefore has north latitude. And by the poſition of that part of the ecliptic, her parallax in longitude, advances her ſo much forward, viz. 24*m*. 13*s*. And therefore ſhe is ſo much paſt the apparent conjunction. Hence we gain theſe ſeveral particulars, as to the eclipſe:

I. The begin. June	4*d*.	6*h*.	50*m*.	42*s*. morn.
middle, - -	4	7	43	27
end, - -	4	8	46	12
total duration, - -		1	45	30

digits eclipſed 5½, on the upper ſide of the ſun, towards the left; as appears by the figure.

II. Hence the POSITION of the HORNS at C and A, are eaſily found in the middle of the eclipſe. For they are in a poſition parallel to RI, the moon's way.

III. The MIDDLE of the eclipſe will not be at the ſame time in all places of the ſame longitude. For the parallax of longitude will be different in different places.

No eclipſe of the ſun can laſt above TWO HOURS. For SI or SA+MD=32*m*. 36*s*.=32. 6, and the horary motion=34*m*. 47*s*.=35. 78. And $\frac{32.\ 6}{35.78}$=.91=54½ minutes, for the ſemiduration.

If it were not for the parallax, eclipſes of the ſun would be as eaſily calculated, as thoſe of the moon. And in order to get the parallax, the angle ZSM and SF muſt be known fig. 2, which occaſions the reſolving ſeveral ſpherical triangles before they can be had. Likewiſe it may be obſerved that the apparent way of the moon is ſtrictly a curve line, concave towards S, which ariſes from the parallel of latitude being a curve, and the moon being out of its plane. Likewiſe the moon's apparent velocity is ſomething greater at the beginning than at the end.

VI. RULES *for* CALCULATING *a* GENERAL ECLIPSE *of the* SUN.

The elements neceſſary for this are. 1. The ſun and moon's place, and the time, at the true conjunction;—2. The moon's latitude, horizontal parallax, diameter, and horary motion; 3. The ſun's declination, diameter, and horary motion; and 4, the angle the moon's way makes with a circle of latitude.

II. From a large ſcale of minutes, take the moon's horizontal parallax in the compaſſes, at any point C, in the right lines BD (which repreſents the ecliptic in Plate XXIII. fig. 15.) deſcribe the circle ABED, for the earth's diſk, or the earth's flat face as it appears at a diſtance, in a line drawn to the ſun. Draw CM perpendicular to CD, and equal to the latitude of the moon upwards, if north. Make the angle CMG equal to that which the moon's way makes with a circle of latitude; acute to the right hand, if ſhe tend to the node; or obtuſe, if ſhe be paſt it; and drawing FMG, it will be the way of the centre of the moon's ſhadow upon the earth. From C let fall CH perpendicular to FG. Then at H will be the middle of the earth's eclipſe.

III. With the centre H, and radius HO, equal to the ſum of the ſemidiameters of the ſun and moon, deſcribe the circle QOR, which will be the moon's penumbra. Alſo deſcribe a ſmall circle round the centre H, whoſe radius is the difference of the ſun and moon's ſemidiameters, that little circle will be the dark ſhadow of the moon. Then all the countries of the earth contained in the ſegment VAW will be ſucceſſively eclipſed, by the penumbra, as the ſhadow moves along the tract FG; while the other ſegment VEW ſuffer no eclipſe at all. All places in the line *st*, will be totally eclipſed, as the dark ſhadow, or the ſmall circle at H paſſes ſucceſſively over them. But this circle, or dark ſhadow, being very ſmall, a total eclipſe at any place continues but a ſmall time. Sometimes the ſun's ſemidiameter exceeds the moon's; and then there will be no dark circle or total eclipſe, but a lucid ring will appear about the moon in theſe places; and this is called an *annular eclipſe*. The difference between the ſemidiameters of the ſun and moon is ſo little, that no total eclipſe laſts above four minutes.

IV. Draw CF, CG = ſum of the ſemidiameters of the ſun and moon, and the moon's parallax; then the moon's ſhadow will touch the earth at L and K where the eclipſe begins and ends. In the triangle CFH, there is given GF, CH; to find FH = HG, which converted into time, gives half the duration, or half the time that the moon's ſhadow is upon the earth. Alſo, NO meaſured, ſhews how far the eclipſe reaches. Or CO meaſured does the ſame. It may be ſufficient to meaſure all theſe by the ſcale without calculation.

V. To find the POLE. Draw the arch AP, making the angle KAP equal to the ſun's longitude, and AP the diſtance of the poles of the equator and ecliptic, 23½ degrees; then P is the pole. For AP is a part of the ſolſtitial colure, and paſſes through Cancer and Capricorn. And CAP is what the ſun wants of Cancer, therefore PAK is what it is paſt Aries. Through P draw CPT. And here we may ſuppoſe that the pole P is fixed, during the time of an eclipſe. Then in the right angled ſpherical triangle APT, there is given AP and angle A; to find AT or angle ACP. In this triangle PT is the ſun's declination, and APT or CPK his right aſcenſion from Cancer. Here note, that any place in the line CT is in the ſun's meridian. And C is the place where the ſun is vertical at the time of the eclipſe.

VI. To find the SITUATION of any given place, at a given hour. Make the angle CPX (with the ſun's meridian,) equal to the time from noon; on the left hand if it is before noon. And make PZ the complement of the latitude; then Z is the place required. And if it falls in the penumbra, it is eclipſed; or any where in the ſegment VAW; if its motion in the parallel circle do not carry it out, before the penumbra reaches it.

VII. To find the place which is firſt or laſt touched by the penumbra, as K. Draw the arch PK. In the triangle CGH, there are given CG and CH, to find the angle GCH, from which ſubtract HCP which is known, gives the angle PCK or TK. Then in the right angled ſpherical triangle PTK, there is given TK, and PT the ſun's declination; to find PK the complement of the latitude of K, and TPK or CPK the difference of longitude of K, and the ſun.—Therefore its longitude and latitude is obtained. In the ſame manner may be found that of L. And by the ſame method the latitude and longitude of the places *s* and *t* may be found, where the dark ſhadow firſt enters the earth's diſk, or quite leaves it. Thus alſo may be found the place which is in the line FH, at any point of time; or if the place be given, what the time will be; and that by help of the horary motion, with other particulars of like nature.

VIII. The part of the ſun's diameter eclipſed by the moon, is known by the ſituation of the place within the penumbra, or its diſtance from the centre of the penumbra. And the phaſis of the eclipſe, as ſeen from any place Z, upon the diſk, will be found thus, for any time. Find the centre of the ſhadow for that time, as ſuppoſe at H. Deſcribe about H, a circle whoſe radius is the moon's radius; and about Z, a circle with the ſun's radius. Then the part cut off the ſun's circle will be the part obſcured.

SECT. VIII. REMARKS *on* ECLIPSES *in* GENERAL.

IN eclipſes of the moon, even when ſhe is near the centre of the earth's ſhadow, her body is ſtill viſible and appears of a tarniſhed *copper colour*. This ſeems to be occaſioned by the rays of light which come from the ſun, and which, paſſing near the earth, are inflected from their rectilinear courſe by our atmoſphere; ſo that they enter the earth's conical ſhadow, and thus produce that faint illumination on the ſurface of the moon, which ſome have ſuppoſed to be her own native light: but there ſeems to be no juſt ground for ſuch a conjecture.

In moſt ſolar eclipſes, the moon's diſk is covered with a faint light, which is attributed to the reflection of the light from the illuminated part of the earth, and in total eclipſes, the moon's limb is ſeen ſurrounded by a pale circle of light; which ſome aſtronomers conſider as an indication of a lunar atmoſphere, but others as the atmoſphere of the ſun; becauſe it is obſerved to move equally with the ſun, but not with the moon.

ECLIPSES have in all ages greatly attracted the attention of mankind. The ignorant and ſuperſtitious have viewed them with terror, and in former ages they were often conſidered as the forerunners of national calamities. The CHINESE, even at the preſent day, upon their appearance, perform the moſt abſurd and ſuperſtitious ceremonies, although they are ſo far acquainted with their nature, as to be able to predict them. See CHINA. But true philoſophy has taught us, that inſtead of theſe appearances being portentous of *evil* to mankind, they may, by proper obſervations upon them, be made of great tage to the ſciences, and to ſome of the arts of life.

We have already ſhewn, that, by eclipſes of the moon, the earth is demonſtrated to be a globular figure. The longitudes of places on the earth are alſo determined by obſervations on ſolar and lunar eclipſes; as will appear by conſulting the articles GEOGRAPHY, LONGITUDE, NAVIGATION, &c. Eclipſes are alſo of great importance in CHRONOLOGY, (which ſee,) as by them we are enabled to determine exactly the time when events recorded in hiſtory happened.

From obſervations made upon the ancient eclipſes, it appears, that the PERIOD of the moon is now ſhorter, and conſequently that her DISTANCE from the earth is now leſs, than in former ages; and this has been conſidered as an argument againſt thoſe who aſſert, that the world may have exiſted from eternity; for it was hence inferred, that the moon moves in a reſiſting medium, and therefore that her motion muſt by degrees be all deſtroyed, in which caſe ſhe muſt at laſt come to the earth. But M. DE LA PLACE has ſhewn, that this acceleration of the moon's period is a neceſſary conſequence of univerſal gravitation, and that it ariſes from the action of the planets upon the moon. He has alſo ſhewn, that this acceleration will go on, till it arrive at a certain limit, when it will be changed into a retardation; or in other words, that there are two limits, between which the lunar period fluctuates, but neither of which it can paſs.

M. DE LA GRANGE has alſo diſcovered, that all the ſeeming irregularities in the motions of our ſyſtem are periodical; ſo that although the obliquity of the ecliptic, the excentricities of the planetary orbits, the preceſſion of the equinoxes, the length of the year, &c. may change, yet theſe changes will not paſs certain limits, and after ſtated periods, they will return preciſely to what they had formerly been. Some of theſe periods, however, may be very long. The acceleration of the moon, for example, has been going on from the earlieſt ages of aſtronomy to the preſent day.

We cannot cloſe this ſection, without obſerving, that ECLIPSES happen very frequently to the SATELLITES of JUPITER; and, as they are of great ſervice in determining the longitude of places on the earth, aſtronomers have been at pains to calculate tables for the eclipſes of theſe ſatellites, by their primary, for the ſatellites themſelves have never been obſerved to eclipſe one another. But this falls more properly to be conſidered under the article GEOGRAPHY, and LONGITUDE, to which the reader is therefore referred.

The primary planets would alſo eclipſe one another, were it not for their great diſtances; but as the comets are not ſubject to the ſame laws with the planets, it is poſſible they may ſometimes approach ſo near to the primary planets, as to cauſe an eclipſe of the ſun to thoſe planets; and, as the body of a comet bears a much larger proportion to the bulk of a primary planet than any ſecondary, it is plain, that a cometary eclipſe would both be of much longer continuance, and attended with greater darkneſs, than that occaſioned by a ſecondary planet. If we ſuppoſe the primary planet and comet to be moving both the ſame way, the duration of ſuch an eclipſe would be prodigiouſly lengthened; and thus, inſtead of four minutes, the ſun might be totally darkened to the inhabitants of certain places for as many hours: and, from this cauſe, ſome account for that prodigious darkneſs, which we ſometimes read of in hiſtory, at times when no eclipſe of the ſun by the moon, could poſſibly happen.

ASTRO-THEOLOGY, *n. ſ.* divinity founded on the obſervations of the celeſtial bodies.

ASTURIAS, anciently the kingdom of Aſturia, is now a principality of modern Spain. It is bounded by Biſcay on the E. Gallicia on the W. Caſtile and Old Leon on the S. and the ſea on the N. Its greateſt length is about 120 miles, and its breadth 54. The province is tolerably fertile, and produces excellent wines and horſes, but is thinly inhabited. It has mines of gold, lapis lazuli, and vermillion. The moſt remarkable places in this principality are Oviedo, Gyon, Santillana, and St. Andero.

ASUNDER, *adv.* apart; ſeparately; not together.

ASYLUM, *n. ſ. plur.* ASYLA. See SANCTUARY.

AT, *prep.* 1. *At* before a place, denotes the nearneſs of the place; as, a man is *at* the houſe before he is *in* it.—2. *At* before a word ſignifying time, notes the co-exiſtence of the time with the event; the word *time* is ſometimes included in the adjective; we commonly ſay *at* a minute, *at* an hour, *on* a day, *in* a month.—3. *At* before a caſual word ſignifies nearly the ſame as *with*, noting that the event accompanies, or immediately ſucceeds, the action of the cauſe.—4. *At* before a ſuperlative implies *in the ſtate*; as, *at beſt*, in the ſtate of moſt perfection, *&c.*—5. *At* before a perſon, is ſeldom uſed otherwiſe than ludicrouſly; as, he longed to be *at* him, that is, to attack him.—6. *At* before a ſubſtantive ſometimes ſignifies the particular condition or circumſtances of the perſon: as, *at* peace, in a ſtate of peace.—7. *At* before a ſubſtantive ſometimes marks employment or attention.—8. *At* is ſometimes the ſame as *furniſhed with*, after the French *a*.—9. *At* ſometimes notes the place where any thing is, or acts.—10. *At* ſometimes ſignifies in conſequence of.—11. *At* marks ſometimes the effect proceeding from an act.—12. *At* ſometimes is nearly the ſame as *in*, noting ſituation; as, he was *at* the bottom, or top of the hill.—13. *At* ſometimes ſeems to ſignify *in the power of*, or *obedient to*.—14. *At* ſometimes notes the relation of a man to an action.—15. *At*, like the French *chez*, means ſometimes *application to*, or *dependence on*.—16. *At all.* In any manner, in any degree.

ATABULUS, in phyſiology, a provincial wind in Apulia, of a dry pinching quality, and very noxious in its effects.

ATACAMA, a chain of mountains in S. America, which ſeparate Peru from Quito, and here the cold is ſo violent that paſſengers are ſometimes frozen to death.

ATACAMA, a deſert of Peru.

ATACAMA, a harbour of Peru. Long. 5. 20. W. Lat. 0. 22. S.

ATACAMA, a town in Louiſiana.

ATAMASCO LILY, a ſpecies of AMARYLLIS.

ATANTA, in botany, a name given by the people of Guinea to a kind of *ſumach*, called, by Petiver, *rhus Guineenſe trifoliatum ſcabium*, from its being trifoliate, and having rough and ſerrated leaves. This ſomewhat reſembles the hoary trifoliate African ſumach of Pluckenet; but it differs in this, that its leaves are edged with prickles, whereas thoſe of Pluckenet's kind are only deeply ſinuated. The people of Guinea are very fond of it, for its medicinal virtues: they give it as a reſtorative, boiled in water.

ATARAXIA, } *n. s.* exemption from vexation; tran-
ATARAXY, } quillity.

ATAXY, the want of order. With phyſicians, it ſignifies irregularity of criſes and paroxyſms of fevers.

To ATCHIEVE, *v. a.* to finiſh or make an end of; but ſignifies, in its ordinary acceptation, to perform great actions or exploits.

ATCHIEVEMENT, in heraldry, denotes the arms of a perſon or family, with all the exterior ornaments of the ſhield.

ATCHI Kounipi, a lake in Labrador, the waters of which run in a direction ſouthward, till they fall into the river St. Lawrence.

ATCHISON'S Haven. See Acheson's Haven, and Morison's Haven.

ATE. The preterite of *eat.* See *To* Eat.

ATEMPER, *adj.* moderate.

ATEMPO giusto, in muſic, ſignifies to ſing or play in an equal, true, and juſt time.

ATH, or Æth, a ſtrong town of the ci-devant Auſtrian Netherlands, in one of the new departments, lately annexed to the territory of the republic of France. It is ſeated on the Dender, 12 miles N. W. of Mons.

ATHAMANTA, spignel: A genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ.*

ATHANASIA, goldilocks: A genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ diſcoides.*

Athanasia, in botany, is uſed by ſome authors for tanzy.

ATHANASIAN creed; a formulary, or confeſſion of faith, long ſuppoſed to have been drawn up by Athanaſius, biſhop of Alexandria, in the 4th century, to juſtify himſelf againſt the calumnies of his Arian enemies. But it is now generally allowed among the learned not to have been his.

ATHANOR, *n. s.* a digeſting furnace to keep heat for ſome time; ſo that it may be augmented or diminiſhed at pleaſure, by opening or ſhutting ſome apertures made on purpoſe with ſliders over them, called regiſters.

Athanor, description of an. Chemiſts have given this name to a furnace ſo conſtructed, that it can always maintain an equal heat, and laſts a long time, without addition of freſh fuel. The body of the athanor has nothing in it particular, and is conſtructed like ordinary furnaces. But, at one of its ſides, or its middle, there is an upright hollow tower, which communicates with the fire-place, by one or more ſloping openings. This tower ought to have a lid, which exactly cloſes its upper opening. When the athanor is to be uſed, as much lighted coal is put in the fire-place as is judged neceſſary, and the tower is filled to the top with unlighted fuel. The tower is then to be exactly cloſed with its lid. As faſt as the coal in the fire-place is conſumed, that in the tower falls down and ſupplies its place. As the coal contained in the tower has no free communication with the external air, it cannot burn, till it falls into the fire-place. The athanor being much celebrated and uſed by ancient chemiſts, it has been particularly deſcribed by many authors, and was formerly found in all laboratories. At preſent, this furnace is much leſs employed, and is even neglected. See Plate X. fig. 9. The lamp furnace, which is a true athanor, may be ſucceſsfully employed in operations which do not require much heat.

ATHARER, in aſtrology, a term uſed when the moon is in the ſame degree and minute with the ſun.

ATHEISM, *n. s.* the diſbelief of a God.

ATHEIST, *adj.* atheiſtical; denying God.

Atheist, *n. s.* one who denies the exiſtence of God, and attributes ſurrounding nature and all its aſtoniſhing phenomena to *chance,* or a *fortuitous concourſe* of atoms.

Atheist may alſo be defined, a perſon who does not believe in any being ſuperior to the material world. Lord Bacon ſays, "that though a ſmattering of philoſophy may lead a man into atheiſm, a deep draught will certainly bring him back again to the belief of a God and Providence.

ATHEISTICAL, *adj.* given to atheiſm; impious.

ATHEISTICALLY, *adv.* in an atheiſtical manner.

ATHEISTICALNESS, *n. s.* the quality of being atheiſtical.

ATHEISTIC, *adj.* given to atheiſm.

ATHELSTANEFORD, a pariſh of Scotland, in the county of Haddington, ſeparated from that of Haddington, on the S. and S. W. by the Lugdown, and from that of Dirleton on the N. by the Peffer. It it an oblong ſquare, 4 miles long, and between 2 and 3 broad, and contains about 3750 acres.

ATHENATORIUM, among chemiſts, a thick glaſs cover, placed on a cucurbit, having a ſlender umbo, or prominent part, which enters like a ſtopple, within the neck of the cucurbit.

ATHENIAN, *adj,* belonging to Athens: alſo a perſon curious of novelties.

Athenians, the inhabitants of Athens, but applied in a more extenſive ſenſe, to the whole people of Attica.

ATHENS, a celebrated city of ancient Greece, the capital of the kingdom of Attica, ſituated 100 miles N. E. of Lacedæmon, and 320 S. by W. of Conſtantinople. It is the capital of Livadia and is ſeated on the gulf of Engia.

Athens, city of, now called Setines, which ſee.

Athens, a townſhip in the ſtate of Vermont, and county of Windham. It is nearly 6 miles W. of Connecticut river, and contains about 450 inhabitants.

ATHERINA, in ichthyology, a genus of fiſhes of the order of abdominales.

ATHEROMA, *n. s.* a ſpecies of wen, which neither cauſes pain, diſcolours the ſkin, nor yields eaſily to the touch.

ATHEROMATOUS, *adj.* [from *atheroma,*] Having the qualities of an atheroma, or curdy wen.

ATHIRST, *adv.* [from *a* and *thirst.*] Thirſty; in want of drink.

ATHNACH, the name of one of the principal of the Hebrew accents, which ſerves not only to regulate the voice, but to diſtinguiſh the members of a ſentence, whence its name *athnach,* i. e. reſpiration. On this account it is called *king* and *pauſe,* and anſwers to our colon, and ſometimes to a note of interrogation.

ATHOL, or } the moſt northern diſtrict of Perthſhire in
ATHOLL, } Scotland, extending in length 43 miles, and in breadth 30.

Athol, a townſhip in Maſſachuſetts, and county of Worceſter. It contains 16000 acres of land, which for the moſt part is very rocky, but well watered. It it ſituated about 72 miles N. W. of Boſton. The inhabitants amount nearly to 1000. In this townſhip there are 6 ſaw-mills, 4 griſt-mills, a fulling-mill, and a trip-hammer. On one of the banks of Miller's river, 20 feet above the water, there is a Medicinal Spring famed on account of its many virtues.

ATHWART, *adv.* 1. In a manner vexatious and perplexing ; croſsly.—2. Wrong.

Athwart, *prep.* acroſs ; tranſverſe to any thing.

Athwart, in navigation, is ſynonimous with acroſs the line of the courſe. It is alſo uſed in other ſenſes, ſuch as,

1. Athwart, hause, expreſſes the ſituation of a ſhip, when ſhe is driven by wind or tide, or any other accident, acroſs the fore part of another.

2. Athwart ships, reaching acroſs ſhips from one ſide to the other.

3. Athwart the fore foot, denotes the flight of a cannon ball from one ſhip acroſs the courſe of another, to intercept the latter, and oblige her to ſhorten ſail, that the former may come near enough to examine her.

ATLANTIC ocean, that immenſe Sea bounded by Europe and Africa on the E. and by America on the W.

ATLAS, *n. s.* 1. a collection of maps, ſo called probably from a picture of *Atlas* ſupporting the heavens, prefixed to ſome collection.—2. A large ſquare folio ; ſo called from theſe folios, which, containing maps, were made large and ſquare.—3. Sometimes the ſupporters of a building.—4. A rich kind of ſilk or ſtuff made for women's cloaths.

Atlas, in anatomy, the name of the firſt vertebra of the neck, which ſupports the head. It has no ſpinal apophyſes ; becauſe the motions of the head do not turn on this vertebra, but on the ſecond.

Atlas, in commerce, a ſilk ſatin, manufactured in the Eaſt Indies.

Atlas, in geography, a chain of mountains in Africa, which ſeparate Barbary from Biledulgerid, and are ſuppoſed almoſt to divide the continent from E. to W.

Atlas, in zoology, a ſpecies of beetle.

ATMOSPHERE, *n. s.* vapour. The exterior part of this our habitable world is the air, or *atmoſphere* : a light, thin, fluid, or ſpringy body, that encompaſſes the ſolid earth on all ſides.

Atmosphere, additional definition of. The word is uſed to ſignify the whole of the fluid maſs conſiſting of air, aqueous and other vapours, electric fluids, &c. which ſurrounds the earth to a conſiderable height, and partakes of both its diurnal motion on its axis, and its annual motion round the ſun.

Atmosphere, component parts of the. It will readily appear, that the atmoſphere muſt, upon the whole, be a very heterogeneous maſs, ſince it is the common receptacle of all the effluvia, exhalations, and particles, raiſed from innumerable bodies upon the earth, hence it has been compared to a vaſt chemical veſſel in which the matter of all kinds of bodies is continually floating and thus expoſed to the action of the ſun ; from whence proceed innumerable operations, ſublimations, ſeparations, compoſitions, digeſtions, fermentations, putrefactions, &c. The diſcoveries of modern chemiſtry have however ſhewn us, that atmoſpheric air has for its *eſſential* conſtituents, two elaſtic fluids ; called by the Engliſh chemiſts, phlogisticated air, and dephlogisticated or pure air, and by French chemiſts oxygen gas and azotic gas. Concerning theſe conſtituents and their proportions, we have already treated under Aerology. The electrical fluid is alſo very diſtinguiſhable in the maſs of our atmoſphere, and although we are ignorant as to its preciſe quantity, yet we know that it is more abundant in the ſuperior than in the inferior regions, and it has been with probability ſuppoſed to be the immediate bond of union between the atmoſphere and the great quantity of water ſuſpended in it, and hence it is concerned in the production of rain, hail, ſnow, and other meteors.

Atmosphere, figure of the. If the earth had no diurnal rotation upon its axis, then according to the laws of gravity the atmoſphere would be of an uniform thickneſs, incloſing the earth which in this caſe would be perfectly ſpherical. But as the earth and the atmoſphere revolve about an axis, the different parts of both have a centrifugal force, by which their gravity is diminiſhed, towards the equator ; and hence the figure of the atmoſphere will be an oblate ſpheroid, ſince the parts that correſpond to the equator are farther removed from the centre than the parts that correſpond to the poles. Beſides, the figure of the atmoſphere muſt on another account repreſent a flattened ſpheroid ; namely, becauſe the ſun ſtrikes more directly the air between the tropics, than the air in the polar regions, and hence the maſs of their adjoining to the poles, being leſs heated, cannot expand ſo much, nor reach ſo high as the air in the neighbourhood of the equator. And yet higher columns about the equatorial regions may not be heavier than thoſe at the poles ; ſeeing that the ſame force which contributes to elevate the air, diminiſhes its gravity and preſſure on the ſurface of the earth. Mr. Kirwan has given, in the Tranſactions of the Royal Iriſh Academy, an ingenious diſſertation on the figure, height, weight, &c. of the atmoſphere, where he obſerves, that in the natural ſtate of the atmoſphere, its weight muſt be equal over all the earth, and ſince the denſity of the air at the earth's ſurface encreaſes from the equator to the poles, its height muſt diminiſh from the poles to the equator, and from this it follows that although the equatorial air be leſs denſe to a certain height than the polar, yet at ſome greater heights it muſt be more denſe. Hence it is inferred, that in the higheſt regions of the atmoſphere, the denſer equatorial air not being ſupported by the collateral extra-tropical columns, gradually flows over and rolls down to the north and ſouth.

Atmosphere, gravity of the. It has been allowed by almoſt all philoſophers, ancient as well as modern, that the atmoſphere is endowed with weight and preſſure. The truth of this principle will be completely demonſtrated under the article Pneumatics. It will there appear that preſſure of the atmoſphere at the ſurface of the earth, upon any baſe, is equal to the preſſure of a column of mercury of an equal baſe, and 30 inches height ; or it is equal to a column of water 34½ feet high. Hence the weight of the atmoſphere on every ſquare inch of ſurface is 15 lb. avoirdupoiſe. Mr. Cotes has computed that the whole preſſure upon the ſurface of the earth is equivalent to that of a globe of lead of 60 miles in diameter ; and hence alſo it appears that the preſſure upon the human body muſt be very conſiderable ;

conſiderable; for if the ſurface of a man's body be computed at 15 ſquare feet, he muſt ſuſtain 32,400 lb. or 14½ tons weight as his ordinary load; that he does not feel this preſſure, is owing to his fluids being acquired gradually, and therefore they have mixed with them ſuch a portion of air, as ſerves by its elaſticity, to counterbalance the preſſure of the atmoſphere. In countries at a diſtance from the equator, the barometer varies in its height, from 28 to 31 inches, or about one tenth of the whole; ſo that the preſſure of the atmoſphere will be ſometimes one tenth of its whole weight leſs than at other times, this difference amounts to about a ton and a half upon the body of a man. On the encreaſe of this natural weight the weather is commonly fine, and we feel ourſelves what we call braced and more active, but on the contrary, when the weight of the air diminiſhes, the weather is bad, and people feel a liſtleſneſs and inactivity about them. Hence when the variations of the barometer and atmoſphere are ſudden and great, we feel the alteration and effect on our bodies and ſpirits very much; but when a change takes place by ſlow degrees, we are ſcarcely ſenſible of it, by reaſon of the power which we have of accommodating ourſelves to this and many other changes in the circumſtances of life. Thus when we aſcend gradually from the bottom to the top of a mountain, we feel no inconvenience, although the preſſure be conſiderably diminiſhed, but ſuch as have aſcended rapidly to great heights in balloons, or deſcended to the bottom of the ſea in diving bells, have been affected moſt ſenſibly by the change of preſſure upon their bodies. It is difficult to aſſign the true reaſon for the variations that happen in the gravity of the atmoſphere at the ſame place. One cauſe ſeems to be the heat of the ſun, for where this is uniform, the changes are ſmall and regular. Thus between the tropics the barometer ſinks about half an inch every day, and riſes to its former height in the night time, but in the temperate zones, the barometer ranges between 28 and 31 inches, ſhewing by its various altitudes, the changes about to take place in the ſtate of the weather, therefore we may conclude that the cauſes which influence the weather, alſo affect the gravity of the atmoſphere.

Atmosphere, height and density of the. If the air had no elaſtic power, but were every where of the ſame denſity, from the ſurface of the earth to the top of the atmoſphere, it would be an eaſy matter to determine its height, from knowing its denſity, and the column of mercury it can ſuſtain in the barometer; for ſince the weight of a column of the atmoſphere is equivalent to a column of mercury upon the ſame baſe and 2½ feet high, and ſince mercury is 11,040 times heavier than air, it follows that the height of the atmoſphere would be 11,040 times 2½ feet, or a little more than 5¼ miles. But it is found by experiment that the air is elaſtic, and that the ſpaces which it occupies when compreſſed by different weights, are reciprocally proportional to the weights themſelves, ſo that the more the air is preſſed, the leſs ſpace it takes up, hence the air in the ſuperior regions of the atmoſphere muſt be more and more rare as it aſcends higher, and according to that law it muſt extend to an indefinite height. Upon the ſuppoſition that the denſity of the air is always in proportion to the compreſſing force, and that the force of gravity is the ſame at all heights in the atmoſphere, the celebrated Dr. Halley firſt determined the law by which the denſity of the atmoſphere at different heights is diminiſhed, and he ſhewed, that if the heights be taken in an arithmetical progreſſion, the denſities at theſe heights decreaſe in geometrical progreſſion. There are however many circumſtances that affect the denſity of the atmoſphere, and which have not entered into the hypotheſis upon which the above concluſion of Dr. Halley is founded, as appears from the experiments of M. De Luc, Sir George Shuckburgh, and General Roy. Theſe will fall to be more particularly conſidered under the article PNEUMATICS. It is found from obſervations made upon the barometer at different heights, that air at the height of 3½ miles above the earth's ſurface, is only one half the denſity of air at the ſurface, hence at the height of 7 miles it muſt be only one fourth of the denſity, and ſo on as in the following table.

Height in miles.	Number of times rarer.
3½	2
7	4
14	16
21	64
28	256
35	1024
42	4096
49	16384
56	65536
63	262144
70	1048576

By continuing the calculations of this table, it might be ſhewn that a cubic inch of the air we breathe would at the height of 500 miles, be ſo much rarefied, that it would fill a ſphere equal in diameter to the orbit of Saturn. Hence if all the planets have atmoſpheres, they will be ſo attenuated at the diſtances of the planets from one another, as to give no ſenſible reſiſtance to their motions round the ſun, for thouſands of ages. Even at the height of about 50 miles, our atmoſphere is ſo rare as to have no ſenſible effect upon the rays of light, as appears from the duration of the twilight, and from the magnitude of the terreſtrial ſhadow in lunar eclipſes. From what has been ſaid it appears that the air is 10,000 times more rare at that height than at the ſurface of the earth. Conſidering the extreme rarity of the atmoſphere at the height of only 40 or 50 miles, it is ſurpriſing that ſome meteors ſhould be enflamed at ſuch heights as they have been obſerved at. Dr. Halley ſaw one in 1719, whoſe height he computed to be between 69 and 73⅓ Engliſh miles, its diameter 2800 yards, or more than 1½ mile, and its velocity about 350 miles per minute. In 1783 a meteor was ſeen, whoſe diſtance could not be leſs than 90 miles, its diameter at leaſt equal to the former, and velocity 1000 miles per minute. It is difficult to conceive how the atmoſphere at ſuch a height can have denſity ſufficient to ſupport flame, or to propagate ſound, and yet exploſions have been heard, and even a hiſſing noiſe has been ſaid to accompany ſome ſuch meteors. Dr. Halley has conjectured that the vaſt magnitude of ſuch bodies, might compenſate for the thinneſs of the medium in which they moved, which indeed muſt have been 1000 times rarer than the vacuum of a good air pump. Theſe appearances are by ſome conſidered as connected with electricity, although it muſt be obſerved, the phænomena differ conſiderably from thoſe exhibited by the electrical ſpark when paſſing through a rare medium. See Electricity.

Atmosphere, refractive and reflective powers of the. The refractive power of the atmoſphere has already been explained, under Astronomy. It has alſo a reflective power, that ſerves to enlighten thoſe parts of an object which are not expoſed to a direct light. The want of this power would occaſion a great alteration in the appearance of things, the ſhadows of which would be ſo very dark, and their ſides enlightened by the ſun ſo very bright, that probably we could ſee no more of them, than their bright halves. Such a pellucid unreflective atmoſphere would, indeed, have been very commodious for aſtronomical obſervations, for the fixed ſtars would have been viſible by day, as well as by night; but there would have been no twilight, ſo that there would have been a ſudden tranſition from light to darkneſs, and from darkneſs to light, immediately upon the riſing or ſetting of the ſun. This reflective power of the atmoſphere prevents a great deal of the light that comes from the heavenly bodies from reaching us, when they are in, or near the horizon; for from the experiments of Mr. Bouguer it appears that the light of the moon is ſometimes 2000 times weaker in the horizon, than when her altitude is 66°. See a table of the intenſities of light at different altitudes under Optics.

Atmosphere, salubrity of the. Although it is agreeable to experience, that denſe air is more proper for reſpiration, than air that is extremely rare: yet the air of mountains, by reaſon of its purity, is found to be more ſalubrious than the air of pits and low ſituations, where the atmoſpherical air is generally tainted by noxious vapours. M. de Sauſſure concludes, that the air between the two extremes, or about the height of 500 or 600 yards above the level of the ſea, is the moſt ſalubrious and proper for animal life. Other cauſes, beſides the mere difference of altitude affect the ſalubrity of the atmoſphere. Air when confined and ſtagnant is leſs pure than when it is agitated and ſhifted, hence, the air in a bed-chamber is leſs ſalubrious in a morning, after it has been ſlept in, than in an evening. The air in ſome caſes has been found remarkably impure after cloſe and ſultry weather, and Dr. Ingenhouſz remarks, that the air at ſea, and cloſe to it, is in general purer and fitter for animal life, than the air on land, but there ſeems to be little difference between the air of towns, and that of the country, or between the air of one town and that of another.

Atmosphere, various temperature of the. With regard to the variations of heat and cold in the atmoſphere, many hypotheſes have been framed, and experiments made; as may be ſeen by conſulting M. Bouguer's obſervations in Peru, Lambert, de Luc, Sauſſure's Journeys on the Alps, Sex's and Darwin's Experiments, in Phil. Tran. Vol. LXXVIII. where this laſt gentleman accounts for the changes of temperature that ſometimes takes place in the atmoſphere, from this conſideration, viz. that when air is mechanically expanded, it becomes capable of attracting heat, from other bodies in contact with it, and when it is compreſſed into leſs compaſs, it again gives out the heat which it had acquired, to the bodies in contact with it. Hence it follows, that the temperature of the atmoſphere muſt be continually changing from this cauſe, ſince the ærial currents, and the inequalities on the ſurface of the earth are continually changing its denſity; the air being rarefied when paſſing over high mountains, and again condenſed, when it deſcends into the valleys.

Atmosphere, use of the. Beſides occaſioning the refraction and reflection of light, the atmoſphere is indiſpenſably neceſſary to the exiſtence of all animal and vegetable life, as appears from experiments made with the air pump. Many ſubſtances would not even exiſt in a ſolid form, unleſs prevented from changing to a ſtate of vapour, by the preſſure of the atmoſphere. It is alſo of great utility as a moving power, in navigation and mechanics, as is evident from the motion of ſhips, mills, &c. The aſcent of water in pumps, the operation of ſuction in animals, the lately invented art of Aerostation, and innumerable other phænomena depend entirely on the preſſure of the atmoſphere.

ATMOSPHERIC, or Atmospherical, *adj.* conſiſting of the atmoſphere; belonging to the atmoſphere.

ATOLLENS oculi, in anatomy, a name given by Albinus to one of his *quatuor recti muſculi oculi*. This is the muſcle called by Molinett, and others, the *ſuperbus*, and by Cowper, the *elevator oculi*.

ATOM, *n. s.* 1. Such a ſmall particle as cannot be phyſically divided.—2. Any thing extremely ſmall.

ATOMICAL, *adj.* 1. Conſiſting of atoms.—2. Relating to atoms.

Atomical philosophy, or the doctrine of atoms, a ſyſtem which, from the hypotheſis that atoms are endued with gravity and motion, accounted for the origin and formation of things.

ATOMIST, *n. s.* one who holds the *atomical* philoſophy, or doctrine of atoms.

ATOMOS, a ſpecies of the crab inſect.

To ATONE, *v. a.* 1. To reduce to concord.—2. To expiate; to anſwer for.

To Atone, *v. n.* 1. To agree; to accord.—2. To ſtand as an equivalent for ſomething; and particularly uſed of expiatory ſacrifices; with the particle *for* before the thing for which ſomething elſe is given.

ATONEMENT, *n. s.* 1. Agreement; concord.—2. Expiation; expiatory equivalent. See Expiation.

ATONICS, in grammar, words unaccented.

ATONY, in medicine, a defect of tone or tenſion, or a laxity or debility of the ſolids of the body.

ATOOI, one of the Sandwich iſlands, about 10 leagues in length from E. to W. and ſuppoſed to contain 50,000 inhabitants. There is a good road and anchoring place on the S. W. ſide of it. See Sandwich Islands.

ATRACTYLIS, distaff thistle: a genus of the poylgamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method, ranking under the 49th order, Compoſitæ capitatæ. The corolla is radiated; and each of the little corollæ of the radius has five teeth.

ATRAGEN, in botany: a genus of the polyandria order, belonging to the polygamia claſs of plants.

ATRAPHAXIS, in botany, a genus of the digynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 12th order, Holoraceæ.

ATRESIA, in medicine, imperforation, or the ſtate of thoſe perſons who want ſome natural aperture.

ATRETI, thoſe perſons in whom the *anus*, or genitals, are imperforate, whether naturally, or occaſioned by ſome accident, or diſeaſe; as the growth of ſome fleſhy excreſcence, or membrane, which ſtops the orifice.

ATRICAPILLA, in ornithology, a little bird, commonly known by the name of the black cap, and called, by ſome authors, *ficedula*, *sycalis*, or MELANCHORYPHUS.

ATRICES, or ATTRICES, in medicine, ſmall tubercles about the *anus*.

ATRIP, in nautical language, is applied to the anchor or ſails.

ATRIPLEX, ORACH, or ARRACH: A genus of the monœcia order, belonging to the polygamia claſs of plants; and in the natural method, ranking under the 12th order, Holoraceæ.

ATROCIOUS, *adj.* wicked in a high degree; enormous; horribly criminal.

ATROCIOUSLY, *adv.* in an atrocious manner; with great wickedneſs.

ATROCIOUSNESS, *n. s.* the quality of being enormouſly criminal.

ATROCITY, *n. s.* horrible wickedneſs; exceſs of wickedneſs.

ATROPA, DEADLY NIGHT-SHADE: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method, ranking under the 25th order, Luridæ. The corolla is campanulated; the ſtamina are diſtant; the berry is globular, and conſiſts of two cells. There are 4 ſpecies; of which the following are the moſt remarkable.

1. ATROPA BELLADONNA grows wild in many parts of Britain. It hath a perennial root, which ſends out ſtrong herbaceous ſtalks of a purpliſh colour. Theſe riſe to the height of four or five feet, garniſhed with entire oblong leaves, which, towards autumn, change to a purpliſh colour. The flowers are large, and come out ſingly between the leaves, upon long foot ſtalks; bell ſhaped, and of a duſky colour on the outſide, but purpliſh within. After the flower is paſt, the germen turns to a round berry, a little flatted at the top, about the ſize of a cherry. It is firſt green; but when ripe, turns to a ſhining black, ſits cloſe upon the empalement, and contains a purple juice of a nauſeous ſweet taſte, and full of ſmall kidney ſhaped ſeeds. This ſpecies being remarkable for its poiſonous qualities, is very ſeldom admitted into gardens, nor ſhould it ever be cultivated or allowed to grow in thoſe places to which children have acceſs.

2. ATROPA FRUTFSCENS is a native of Spain, and riſes with a ſhrubby ſtem to the height of ſix or eight feet; dividing into many branches, garniſhed with round leaves, in ſhape like thoſe of the ſtorax tree: theſe are placed alternately on the branches. The flowers come out between the leaves, on ſhort foot ſtalks, ſhaped like thoſe of the former, but much leſs; of a dirty yellowiſh colour, with a few brown ſtripes.

3. ATROPA HERPACEA is a native of Campeachy, and has an herbaceous ſtalk, and a perennial root, which puts forth ſeveral channelled herbaceous ſtalks, riſing about two feet. Towards the top, they divide into two or three ſmall branches, garniſhed with oval leaves, four inches long, and three broad, having ſeveral prominent tranſverſe ribs on their under ſide. The flowers come out from between the leaves, on ſhort foot ſtalks; they are white, and ſhaped like thoſe of the common ſort, but ſmaller.

4. ATROPA MANDRAGORA, the mandrake, has been diſtinguiſhed into the male and female. The male mandrake has a very large, long, and thick root: it is largeſt at the top or head, and from thence, gradually grows ſmaller. The female mandrake perfectly reſembles the other in its growth; but the leaves are longer and narrower, and of a darker colour, as are alſo the ſeeds and roots. Its freſh root is a violent purge, the doſe being from 10 to 20 grains in ſubſtance, and from half a dram to a dram in infuſion. It has been found to do ſervice in hyſteric complaints; but muſt be uſed with great caution, otherwiſe it will bring on convulſions, and other miſchievous ſymptoms. It has alſo a narcotic quality. At preſent, only the freſh leaves are ſometimes uſed in anodyne and emollient cataplaſms and fomentations. See the article in Plate XIV.

ATROPHY, *n. s.* want of nouriſhment; a diſeaſe, in which what is taken at the mouth, cannot contribute to the ſupport of the body.

ATTACH, *n. s.* tie, obligation, or inclination.

To ATTACH, *v. a.* 1. To arreſt; to take or apprehend by commandment or writ.—2. To ſeize in a judicial manner.—3. To lay hold on, as by power.—4. To win; to gain over; to enamour.—5. To fix to one's intereſt.

ATTACHMENT, *n. s.* 1. Adherence; fidelity.—2. Attention; regard.—3. An apprehenſion of a man to bring him to anſwer an action; and ſometimes it extends to his moveables.

ATTACHMENT, in the law of England, implies the taking or apprehending a perſon by virtue of a writ or precept. It is diſtinguiſhed from an ARREST, by proceeding out of a higher court, by precept or writ; whereas, the latter proceeds out of an inferior court, by precept only. An arreſt lies only on the body of a man; whereas, an attachment lies often on the goods only, and ſometimes on the body and goods.

ATTACHMENT BY WRIT differs from DISTRESS, in not extending to lands, as the latter does; nor does a diſtreſs touch the body, as an attachment does.

ATTACK, *n. s.* an aſſault upon an enemy.

ATTACK is more accurately defined, a violent attempt upon any perſon or thing; an aſſault, or the act of beginning a combat or diſpute.

ATTACK, in the military art, is an effort made to force a poſt, break a body of troops, &c.

ATTACK, FALSE, is that which is not vigorouſly proſecuted, ſerving only to make a diverſion among the beſieged. and to oblige them to divide their forces, that the true attack may be carried on with greater ſucceſs.

ATTACK IN FLANK is to attack both ſides of the baſtion.

ATTACK OF A SIEGE is a furious aſſault made by the beſiegers with trenches, mines, covers, &c. in order to make themſelves maſters of a fortreſs, by ſtorming one of its ſides. If there are two or three attacks made at the ſame time, there ſhould be a communication betwixt them.

ATTACK, REGULAR, an attack made according to the rules of military tactics.

To Attack, *v. a.* 1. To aſſault an enemy: oppoſed to *defence*.—2. To impugn in any manner, as with ſatire, confutation, calumny.

ATTACKER, *n. s.* the perſon who attacks.

ATTAGEN, in ornithology, an Aſiatic partridge, called by ſome a francolin.

To ATTAIN, *v. a.* 1. To gain; to procure; to obtain.—2. To overtake; to come up with: a ſenſe now little in uſe.—3. To come to; to enter upon.

To Attain, *v. n.* 1. To come to a certain ſtate: with *to*.—2. To arrive at.

ATTAINABLE, *adj.* that which may be attained; procurable.

ATTAINABLENESS, *n. s.* the quality of being attainable.

ATTAINDER, *n. s.* the act of attainting in law; convicting of a crime. See *To* Attaint.

Attainder, in law, is the immediate conſequence, when ſentence of death, the higheſt judgment in the Engliſh laws, is pronounced. For when it is now clear beyond all diſpute, that the criminal is no longer fit to live upon the earth, but is to be exterminated as a monſter and a bane to human ſociety, the law ſets a note of infamy upon him, puts him out of its protection, and takes no farther care of him than barely to ſee him executed. A perſon attainted of high treaſon, forfeits all his lands, tenements, and hereditaments; his blood is corrupted, and he and his poſterity rendered baſe. But in the United States, no attainder of treaſon ſhall work corruption of blood or forfeiture, except during the life of the perſon attainted. Conſtitution of the United States, art. XIII. § 3.

ATTAINMENT, *n. s.* that which is attained; acquiſition.

ATTAINT, in the Engliſh law, is a writ that lies after judgment, againſt a jury of twelve men, that have given falſe verdict in any court of record, in an action real and perſonal.

Attaint, or Atteint, in horſemanſhip, a hurt in a horſe's leg, proceeding either from a blow with another horſe's foot, or from an over-reach in froſty weather, when a horſe, being rough ſhod, or having ſhoes with long caulkers, ſtrikes his hinder feet againſt his fore leg.

To Attaint, *v. a.* 1. To diſgrace; to cloud with ignominy.—2. To *attaint* is particularly uſed for ſuch as are found guilty of ſome crime or offence, and eſpecially of felony or treaſon.—3. To taint; to corrupt.

ATTAINTURE, *n. s.* legal cenſure; reproach; imputation.

ATTELABUS, in zoology, a genus of inſects belonging to the order of coleoptera, or beetle kind. It has four wings, of which the ſuperior are cruſtaceous, and ſerve as a ſheath or cover to the inferior, which are membranous. The head tapers behind, and is inclined; the feelers turn thicker towards the apex.

To ATTEMPER, *v. a.* 1. To mingle; to weaken by the mixture of ſomething elſe; to dilute.—2. To ſoften; to mollify.—3. To mix in juſt proportions; to regulate.—4. To fit to ſomething elſe.

ATTEMPT, *n. s.* 1. An attack.—2. An eſſay; an endeavour.

To Attempt, *v. a.* 1. To attack; to invade; to venture upon.—2. To try; to endeavour.

To Attempt, *v. n.* to make an attack.

ATTEMPTABLE. *adj.* liable to attempts or attacks.

ATTEMPTER, *n. s.* 1. The perſon that attempts; an invader.—2. An endeavourer.

To ATTEND, *v. a.* 1. To regard; to fix the mind upon.—2. To wait on; to accompany an inferior.

ATTENDANCE, *n. s.* the act of waiting on another; or of ſerving.

ATTENTION, *n. s.* the act of attending or heeding; the act of bending the mind upon any thing.

ATTENTIVELY, *adv.* heedfully; carefully.

ATTENTIVENESS, *n. s.* the ſtate of being attentive; heedfulneſs; attention.

ATTENUANT, *adj.* what has the power of making thin, or diluting.

ATTENUANTS, or attenuating medicines, are ſuch as ſubtilize and break the humours into finer parts; and thus diſpoſe them for motion, circulation, excretion, &c. Attenuating and inciding medicines are of very extenſive uſe in phyſic, and come under different denominations, according to the different effects they produce. Thus, when tenacious and viſcid juices not only ſtagnate in the cavities of the veſſels, but obſtruct the minute ducts of the viſcera and emunctories, theſe medicines, by their inciding and attenuating qualities, diſcharge the humours, and remove the obſtructions; for which reaſon, they are not improperly called *aperients*. Attenuants produce ſo great a variety of effects, that it is proper we ſhould be well acquainted with their ſeveral kinds, as appropriated to the ſeveral diſorders, and know which will prove moſt ſerviceable in each. When viſcid humours, occaſioning diſorders of the breaſt, are to be attenuated and expectorated, the intention is moſt effectually anſwered by elecampane and orice roots; and by gum ammoniacum, myrrh, or benjamin, and balſam of Peru; or by regenerated tartar, oxymel of ſquills, a ſolution of crabs eyes in diſtilled vinegar, and the ſyrups of tobacco, and the like. When the maſs of blood is tainted by thick and tenacious ſordes, and the emunctories are by that means obſtructed, and the humours contaminated by a ſaline ſulphureous and ſcorbutic dyſcracy, the moſt efficacious of the attenuants are the horſe-radiſh, ſcurvy graſs, water and garden creſſes, muſtard, gum ammoniac, benjamin, myrrh, the oil of fixed nitre, oil of tartar *per diliquium*, ſolutions of nitre, ſpirit of ſal ammoniac, ſalt of wormwood with lemon juice, and the ſalts of the medical waters. When grumous or coagulated blood, occaſioned by contuſions or blows, is to be attenuated, and again diſſolved, the intention is ſure to be anſwered by the roots of Solomon's ſeal, vinegar, and crabs eyes, the regenerated tartar, and nitre prepared with antimony. And in caſes where the lymph has acquired a preternatural thickneſs and viſcidity, eſpecially if from a venereal taint, the curative intention is moſt effectually anſwered by guaiacum, the acrid tincture of acrimony, calomel, æthiops mineral, and the like; which, when ſkilfully uſed, are of ſingular efficacy in diſſolving and attenuating the viſcid juices impacted in the glands of the liver.

ATTESTATION, *n. s.* teſtimony; witneſs; evidence.

ATTIC, *adj.* any thing relating to Attica, or Athens; or any thing peculiarly elegant or excellent.

Attic base, a peculiar kind of baſe uſed by the ancient architects in the Ionic order; and by Palladio, and ſome others, in the Doric.

Attic order, or attics, in architecture, a kind of little order, after the manner of a pedeſtal, raiſed upon another larger order, by way of crowning or to finiſh the building.

Attic story, in architecture, a ſtory in the upper part of a houſe, where the windows are uſually ſquare.

ATTILUS, in ichthyology, a river fiſh, of the ſturgeon kind, called by ſome *adello, adano,* and *adeno.*

ATTINGA, in ichthyology, a ſpecies of the Diodon.

ATTIRE, *n. s.* 1. Clothes; dreſs; habit.—2. In hunting. The horns of a buck or ſtag.—3. In botany. The flower of a plant is divided into three parts, the empalement, the foliation, and the *attire*, which is either florid or ſemiform. *Florid attire*, called thrums or ſuits, as in the flowers of marigold and tanſey, conſiſts ſometimes of two, commonly of three parts. The outer part is the floret, the body of which is divided at the top, like the cowſlip flower, into five diſtinct parts. *Semiform attire* conſiſts of two parts, the chives and apices; one upon each *attire.*

ATTITUDE, *n. s.* the poſture or action in which a ſtatue or painted figure is placed.

ATTORNEY, *n. s.* ſuch a perſon as by conſent, commandment, or requeſt, takes heed, ſees, and takes upon him the charge of other mens' buſineſs, in their abſence. *Attorney* is either general or ſpecial: *Attorney general* is he who by general authority is appointed to all our affairs or ſuits; as the *attorney general* of the State or United States. *Attorneys* ſue out writs or proceſs, or comence, carry on, and defend actions, or other proceedings, in the names of other perſons, in the courts of common law. None are admitted to act without having ſerved a regular clerkſhip, and taking the proper oath, being enrolled, and examined by the judges. The *attorney general* pleads at the bar. To him come warrants for making out patents, pardons, &c. and he is the principal manager of all law affairs of the State or United States.

ATTRACTION, *n. s.* 1. The power of drawing any thing.—2. The power of alluring or enticing.

Attraction, in natural philoſophy, a general term uſed to denote the cauſe by which bodies tend towards each other, and cohere till ſeparated by ſome other power. The principle of attraction, in the Newtonian ſenſe of it, ſeems to have been firſt ſurmiſed by Copernicus. "As for gravity, (ſays he) I conſider it nothing more than a certain natural appetence (*appetentia*) that the Creator has impreſſed upon all the parts of matter, in order to their uniting or coaleſcing into a globular form, for their better preſervation; and it is probable that the ſame power is alſo inherent in the ſun and moon, and planets, that thoſe bodies may conſtantly retain that round figure in which we behold them." (*De Rev. Orb. Cæl. lib.* 1. *c.* 9.) And Kepler calls gravity a corporeal and mutual affection between ſimilar bodies, in order to their union; and ſays poſitively, that no bodies whatſoever were abſolutely light, only relatively ſo; and conſequently, that all matter was ſubjected to the law of gravitation. (*Aſt. Nov. Introd.*) Attraction, conſidered as a quality ariſing from the ſpecific forms of bodies, ought, together with ſympathy, antipathy, and all occult qualities, to be exploded. Theſe being ſet aſide, there remain innumerable phenomena of nature, and particularly the gravity or weight of bodies, or their tendency to a centre; which argue a principle of action ſeemingly diſtinct from impulſe, where at leaſt there is no ſenſible impulſion concerned. Nay, this action in ſome reſpects differs from all impulſion we know of; impulſe being always found to act in proportion to the ſurface of bodies, whereas gravity acts according to their ſolid contents, and conſequently muſt ariſe from ſome cauſe that penetrates the whole ſubſtance thereof. This principle unknown in reſpect to its cauſe, (for its phenomena and effects are obvious, with all their ſpecies and modifications,) we call *attraction;* which is a general name, under which may be ranged all mutual tendencies, where no phyſical impulſe appears, and which cannot therefore be accounted for, from any known laws of nature. And hence ariſe divers particular kinds of attraction; as *Gravity, Magnetiſm, Electricity,* &c. which are principles acting by different laws, and only agreeing in this, that we do not ſee any phyſical cauſes; but, as to our ſenſes, they may really ariſe from ſome power or efficacy in ſuch bodies, though our reaſon diſallows of any ſuch action.

Attraction, different kinds of. Atraction may be divided into two kinds. 1. That which extends to a *ſenſible diſtance.* Such are the attraction of gravity found in all bodies; and the attraction of magnetism and electricity, found in particular bodies; ſee under theſe articles. The attraction of gravity, called alſo among mathematicians the centripetal force is one of the moſt univerſal principles in nature. We ſee and feel it operate on bodies near the earth, and find by obſervation, that the ſame power alſo obtains in the moon, and the other planets primary and ſecondary, as well as in the comets; and even that this is the very power whereby they are all retained in their orbits, &c. Hence, as gravity is found in all the bodies which come under our obſervation, it is inferred, that it obtains in all others: and as it is found to be proportioned to the quantity of matter in each body, it muſt be in every particle thereof; and hence every particle in nature is proved to attract every other particle, &c. See the application of this principle to the celeſtial motions, under Astronomy. By this heavy bodies deſcend, and light ones aſcend; projectiles are directed, vapours and exhalations riſe, and rains, &c. fall. By this rivers glide, the air preſſes, the ocean ſwells, &c. In effect, the motions ariſing from this principle make the ſubject of that extenſive branch of mathematics, called *mechanics* or *ſtatics,* with the parts or appendages thereof, hydroſtatics, pneumatics, &c. II. That which does not extend to *ſenſible diſtances.* Such is found to obtain in the minute particles whereof bodies are compoſed, which attract each other at or extremely near the point of contact, with forces ſuperior to that of gravity, but which at any diſtance from it decreaſe much faſter than the power of gravity. This power an ingenious author chooſes to call the attraction of cohesion, as being that whereby the atoms or inſenſible particles of bodies are united into ſenſible maſſes. This latter kind of attraction owns Sir Iſaac Newton for its diſcoverer; as the former does for its improver. The laws of motion, percuſſion, &c. in ſenſible bodies under various circumſtances, as falling, projected, &c. aſcertained by the later philoſophers, do not reach to thoſe more recluſe inteſtine motions of the component particles of the ſame bodies, whereon the changes of the texture, colour, properties, &c. of bodies depend; ſo that our philoſophy, if it were only founded on the principle of gravitation, and carried ſo far as that would lead us, would be very deficient. III. But beſides the common laws of ſenſible maſſes, the minute parts they are compoſed of are found ſubject to others, which have been but lately taken notice of, and are even yet imperfectly known. Sir Iſaac Newton, to whoſe happy penetration we owe the hint, contents himſelf with eſtabliſhing that there are ſuch motions in the *minima naturæ*, and that they flow from certain powers or forces, not reducible to any of thoſe in the great world. He ſhews that, by virtue of theſe powers, "the ſmall particles act on one another even at a diſtance; and that many of the phænomena of nature are the reſult. Senſible bodies, we have obſerved, act on one another in various ways; and as we thus perceive the tenor and courſe of nature, it appears highly probable, that there may be other powers of the like kind; nature being very uniform and conſiſtent. Thoſe juſt mentioned reach to ſenſible diſtances; but there may be others which reach to ſuch ſmall diſtances as have hitherto eſcaped obſervation; and it is probable electricity may reach to ſuch diſtances, even without being excited by friction." This great author confirms the reality of theſe conjectures, by a great number of phænomena and experiments, which plainly argue ſuch powers and actions between the particles, *e. g.* of ſalts and water, vitriolic acid and water, nitrous acid and iron, &c. He alſo ſhows, that theſe powers, &c. are unequally ſtrong between different bodies; ſtronger, *e. g.* between the particles of ſalt of tartar and thoſe of nitrous acid, than thoſe of ſilver; between nitrous acid and lapis calaminaris than iron; between iron than copper; copper than ſilver or mercury. Thus vitriolic acid acts on water, but more on iron or copper, &c. Innumerable other experiments countenance the exiſtence of ſuch a principle of attraction in the particles of matter. Theſe actions, in virtue whereof the particles of the bodies above mentioned tend towards each other, the author calls by the general indefinite name, *attraction;* which is equally applicable to all actions whereby diſtant bodies tend towards one another, whether by impulſe or by any other more latent power: and hence he accounts for an infinity of phænomena, otherwiſe inexplicable, to which the principle of gravity is inadequate. "Thus (adds our author) will nature be found very conformable to herſelf and very ſimple; performing all the great motions of the heavenly bodies by the attraction of gravity, which intercedes thoſe bodies, and almoſt all the ſmall ones of their parts, by ſome other attractive power diffuſed through their particles. Without ſuch principles, there never would have been any motion in the world; and without the continuance of it, motion would ſoon periſh; there being otherwiſe a great decreaſe or diminution of it, which is only ſupplied by theſe active principles." It is certainly unjuſt in the generality of foreign philoſophers to declare againſt a principle which furniſhes ſo beautiful a view, for no other reaſon but becauſe they cannot conceive how one body ſhould act on another at a diſtance. Indeed philoſophy allows of no action but what is by immediate contact and impulſion; for how can a body exert any active power where it does not exiſt? Yet we ſee effects without perceiving any ſuch impulſe; and where there are effects, we infer there are cauſes, whether we ſee them or not. But we may conſider ſuch effects without entering into the conſideration of the cauſes, as indeed it ſeems the buſineſs of a philoſopher to do: for to exclude a number of phænomena which we do ſee, will be to leave a great chaſm in the hiſtory of nanature; and to argue about actions which we do not ſee, will be to build caſtles in the air. It follows, therefore, that the phænomena of attraction are matter of phyſical conſideration, and as ſuch, entitled to a ſhare in the ſyſtem of phyſics; but that the cauſes thereof will only become ſo when they become ſenſible; *i. e.* when they appear to be the effect of ſome higher cauſes; for a cauſe is no otherwiſe ſeen than as itſelf is an effect, ſo that the firſt cauſe muſt needs be always inviſible: we are therefore at liberty to ſuppoſe the cauſes of attraction what we pleaſe, without any injury to the effects. The illuſtrious author himſelf ſeems a little indetermined as to the cauſes; inclining ſometimes to attribute gravity to the action of an immaterial cauſe, (*Optics*, *p.* 343, *&c.*) and ſometimes to that of a material one. (*Ib. p.* 325.) The cauſe even of any the groſſeſt and moſt ſenſible action, is not adequately known. How impulſe or percuſſion itſelf produces its effects, *i. e.* how motion is communicated by body to body, confounds the deepeſt philoſophers; yet impulſe is received not only into philoſophy, but into mathematics; and the laws and phænomena of its effects make the greateſt part of common mechanics. The other ſpecies of attraction, therefore, in which no impulſe is obſervable, when their phenomena are ſufficiently aſcertained, have the ſame title to be promoted from phyſical to mathematical conſideration; and this without any previous inquiry into their cauſes, to which our conceptions may not be proportionate. Our great philoſopher, then, far from adulterating ſcience with any thing foreign or metaphyſical, as many have reproached him with doing, has the glory of having thrown every thing of this kind out of his ſyſtem, and of having opened a new ſource of ſublimer mechanics, which, duly cultivated, might be of infinitely greater extent than all the mechanics yet known. It is hence alone we muſt expect to learn the manner of the changes, productions, generations, corruptions, &c. of natural things; with all that ſcene of wonders opened to us by the operations of chemiſtry. Some of our own countrymen have proſecuted the diſcovery with laudable zeal. Dr. Keil in particular has endeavoured to deduce ſome of the laws of this new action, and applied them to ſolve ſome of the more general phenomena of bodies, as coheſion, fluidity, elaſticity, ſoftneſs, fermentation, coagulation, &c. and Dr. Freind, ſeconding him, has made a further application of the ſame principles, to account for almoſt all the phenomena that chemiſtry preſents. Some philoſophers therefore think, that the new mechanics are already raiſed to a complete ſcience, and that nothing now can occur but what we have an immediate ſolution of, from the attractive force. But this ſeems a little too precipitate: a principle ſo fertile ſhould have been further explored; its particular laws, limits, &c. more induſtriouſly detected and laid down, before we had proceeded to the application. Attraction in the groſs is ſo complex a thing, that it may ſolve a thouſand different phenomena alike. The notion is but one degree more ſimple and preciſe than action itſelf; and, till more of its properties are aſcertained, it were better to apply it leſs, and ſtudy it more. It may be added, that ſome of Sir Iſaac Newton's followers have been charged with falling into that error which he induſtriouſly avoided, viz. of conſidering attraction as a cauſe or active property in bodies, not merely as a phenomenon or effect.

ATTRACTIVE, *n. s.* that which draws or incites; allurement.

ATTRACTOR, *n. s.* the agent that attracts; a drawer.

ATTRIBUTE, *n. s.* 1. The thing attributed to another, as perfection to the Supreme Being.—2. Quality; characteriſtic diſpoſition.—3. A thing belonging to another; an appendant; adherent.—4. Reputation; honour.

Attribute, in phyſics, a quality determining ſomething to be after a certain manner. Thus underſtanding is an attribute of mind, and extenſion an attribute of body.

Attributes, in logic, the predicates of any ſubject, or what may be affirmed or denied of any thing.

Attributes, in painting and ſculpture, ſymbols added to ſeveral figures, to intimate their particular office and character.

Attributes, in theology, the ſeveral qualities or perfections of the Divine nature.

To ATTRIBUTE, *v. a.* to aſcribe; to give; to yield as due.—2. To impute, as to a cauſe.

ATYS, the ſon of Crœſus, king of Lydia, is reported to have been born tongue-tacked, and of conſequence to have been dumb for many years; till obſerving one of Cyrus's ſoldiers going to kill his father, his paſſion ſuddenly broke the membrane that held his tongue, and he cried out, "Save the King!"

AVA, a kingdom of Aſia, in the peninſula beyond the Ganges.

Ava, a kingdom of Japan, in the iſland of Xicoco, between Niphon and Bongo.

Ava, a kingdom of Japan, in the peninſula of Niphon.

Ava, a large city of Aſia, the metropolis of the kingdom of Burmah, ſeated on the river Ava.

Ava, a large river of Aſia, which riſes in Thibet, croſſes the kingdoms of Burmah, and Pegu, and falls into the Bay of Bengal, by ſeveral mouths.

Ava, a long tract of coaſt, on the E. ſide of the Gulph of Bengal, extending from the S. extremity of Aracan, to Negraias, and divided from Pegu on the E. by the river Ava; it abounds with mines of ſilver, copper, and lead; as well as with elephants and horſes.

Ava, the metropolis of Ava, in Xicoco.

AVAIL, *n. s.* profit; advantage; benefit.

To Avail, *v. a.* 1. To profit; to turn to profit; with *of* before the thing uſed.—2. To promote; to proſper; to aſſiſt.

To Avail, *v. n.* to be of uſe; to be of advantage.

AVAILABLE, *adj.* 1. Profitable; advantageous.—2. Powerful; in force; valid.

AUBE, a department of France, ſo named from the river, bounded on the N. by that of Marne; on the E. by Upper Marne; on the S. by thoſe of the Cote D'Or and Yonne; and on the W. by that of Seine and Marne. Its chief town is Troyes.

Aube, a river of France, which riſes in the department of Upper Marne, and running through that of Aube paſſes by Bar-ſur-Aube, and Arcis, and falls into the Seine, near Nogent.

AUCTION, *n. s.* 1. A manner of ſale in which one perſon bids after another, till ſo much is bid as the ſeller is content to take.—2. The things ſold by auction.

AUCTIONEER, *n. s.* the perſon that manages an auction.

AUCTIVE, *adj.* of an increaſing quality.

AUDACIOUS, *adj.* bold; impudent; daring: always in a bad ſenſe.

AUDACITY, *n. s.* ſpirit; boldneſs; confidence.

AUDIBLE, *adj.* 1. That which may be perceived by hearing.—2. Loud enough to be heard.

AUDIBLENESS, *n. s.* capableneſs of being heard.

AUDIBLY, *adv.* in ſuch a manner as to be heard.

AUDIENCE, *n. s.* 1. The act of hearing or attending to any thing.—2. The liberty of ſpeaking granted; a hearing.—3. An auditory; perſons collected to hear.—4. The reception of any man who delivers a ſolemn meſſage.

AUDIT, *n. s.* a final account.

Audit, is more accurately defined a regular examination of an account by proper officers, appointed for that purpoſe.

AUDITOR, *n. s.* 1. A hearer.—2. A perſon employed to take an account ultimately.

AUDITORY, *adj.* that which has the power of hearing.

Auditory, is alſo uſed for the bench whereon a magiſtrate, or judge, hears cauſes.

AVEIRON, a department of France, bounded by that of Cantal on the N. by thoſe of Lozere and Gard on the E. Herault and Tarn on the S. and Lot on the W. It is named from the river Aveiron, which riſes near Severac, and flowing by Rhodez and Villefranche, falls into the Garonne below Montauben.

AVELLANA, in botany. See Corylus.

Avellana purgatrix, in the materia medica, the fruit of a ſpecies of ricinus.

AVELLANDA, in botany, a name given by the Spaniards to the roots of the *tarſi*, or ſweet *cyperus*. Theſe are eſculent, and of a very delicious taſte; they ſeem to have had the name from their likeneſs to the *avellana*, or hazel nut. Garcias, and ſome others, have thought that the curcas of Malabar was the ſame with the avellanda of Europe. But this does not ſeem to be the caſe; for the curcas, though of the ſame ſize and ſhape with the avellanda, has a hard coat like the common filbert.

AVELLINO, a city of Italy, in the kingdom of Naples, with a biſhop's ſee.

AVENA, oats: A genus of the digynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 4th order, *Gramina*. The calyx has a double valve, and the awn on the back is contorted. There are 13 ſpecies of this plant.

Avena sativa, the common oats cultivated in our

field

fields. It is remarkable that the original native place of this plant is almoſt totally unknown.

To AVENGE, *v. a.* 1. To revenge.—2. To puniſh.

AVENGEANCE, *n. s.* puniſhment.

AVENGEMENT, *n. s.* vengeance; revenge.

AVENGER, *n. s.* 1. Puniſher,—2. Revenger; taker of vengeance for.

AVENTURE, *n. s.* a miſchance, cauſing a man's death, without felony.

AVENUE, *n. s.* 1. A way by which any place may be entered.—2. An ally, or walk of trees before a houſe.

Avenue, in fortification, an opening or inlet into a fort baſtion, or the like place, or the paſſes and ways to and from it.

Avenue, in gardening, a walk planted on each ſide with trees, and leading to an houſe, garden gate, wood, &c. and generally terminated by ſome diſtant object.

To AVER, *v. a.* to declare poſitively, or peremtorily.

AVERAGE, *n. s.* 1. In navigation, a certain contribution that merchants proportionably make towards the loſſes of ſuch as have their goods caſt overboard for the ſafety of the ſhip in a tempeſt; and this contribution ſeems ſo called, becauſe it is ſo proportioned, after the rate of every man's *average* or goods carried.—2. A ſmall duty which merchants, who ſend goods in another man's ſhip, pay to the maſter thereof for his care of them, over and above the freight.—3. A medium; a mean proportion.

Average, in commerce and navigation, is divided into three kinds. I. The ſimple average, which conſiſts in the extraordinary expences incurred for the ſhip alone, or for the merchandize alone; ſuch as the loſs of anchors, maſts, and rigging, occaſioned by the common accidents at ſea; the damages which happen to merchants by ſtorm, prize, ſhipwreck, wet, or rotting; all which muſt be borne and paid by the thing which ſuffered the damage. II. The large and common average, being thoſe expences incurred, and damages ſuſtained, for the common ſecurity of the merchandizes and veſſels, conſequently to be born by the ſhip and cargo, and to be regulated upon the whole. Of this number are the goods or money given for the ranſom for the ſhip and cargo, things thrown overboard for the ſafety of the ſhip, the expences of unloading for entering into a river or harbour, and the proviſions and hire of the ſailors, when the ſhip is put under an embargo. III. The ſmall averages, which are the expences for towing and piloting the ſhip out of or into harbours, creeks, or rivers, one third of which muſt be charged to the ſhip, and two thirds to the cargo.

AVERDUPOIS. See AVOIRDUPOIS.

AVERMENT, *n. s.* 1. Eſtabliſhment of any thing by evidence.—2. An offer of the defendant to juſtify an exception, and the act as well as the offer.

AVERRHOA, in botany, a genus of the decandria order, belonging to the pentagynia claſs of plants; and in the natural method ranking under the 14th order, *Gruinales*. The calix has five leaves, the petals are five, opening at top; and the apple or fruit is pentagonus; and divided into five cells. There are three ſpecies of this plant; the moſt remarkable of which is the CARAMBOLA, called in Bengal the *camrue* or *camrunga*. It poſſeſſes a power ſomewhat ſimilar to the SENSITIVE PLANTS; its leaves on being touched, moving very perceptibly. In the mimoſa the moving faculty extends to the branches; but from the hardneſs of the wood, this cannot be expected in the carambola. The leaves are alternately pinnated, with an odd one; and their moſt common poſition in the day time is horizontal, or on the ſame plane, with the branch from which they come out.

AVERSATION, *n. s.* 1. Hatred; abhorrence; turning away with deteſtation.—2. It is moſt properly uſed with *from* before the object of hate.—3. Sometimes with *to*; leſs properly.—4. Sometimes, very improperly, with *towards*.

AVERSE, *adj.* 1. Malign; not favourable; having ſuch a hatred as to turn away.—2. Not pleaſed with; unwilling to.—3. It has moſt properly *from* before the object of averſion.—4. Very frequently, but improperly, *to*.

AVERSELY, *adj.* 1. Unwillingly.—2. Backwardly.

AVERSENESS, *n. s.* unwillingneſs; backwardneſs.

AVERSION, *n. s.* 1. Hatred; diſlike; deteſtation; ſuch as turns away from the object.—2. It is uſed moſt properly with *from* before the object of hate.—3. Sometimes, leſs properly, with *to*.—4. Sometimes with *for*.—5. Sometimes, very improperly, with *towards*.—6. The cauſe of averſion.

Aversion, according to Lord Kames, is oppoſed to *affection*, and not to *deſire*, as it commonly is.

To AVERT, *v. a.* 1. To turn aſide; to turn off.—2. To cauſe to diſlike.—3. To put by, as a calamity.

AUGER, *n. s.* a carpenter's tool to bore holes with.

AUGES, in aſtronomy, two points in a planet's orbit, otherwiſe called *apſides*, the one denominated the APOGEE, the other PERIGEE.

AUGMENT, *n. s.* 1. Increaſe; quantity gained.—2. State of increaſe.

To Augment, *v. n.* to increaſe; to grow bigger.

AUGMENTATION, *n. s.* 1. The act of increaſing or making bigger.—2. The ſtate of being made bigger.—3. The thing added, by which another is made bigger.

AUGSBURG, a city of Germany, the metropolis of the circle of Suabia, ſeated near the confluence of the Ardech and the Lech, in a very beautiful plain. It is one of the largeſt and handſomeſt cities of the empire, being 9½ miles in circumference; but the fortifications are after the old manner, and very irregular; the ſtreets are broad and ſtraight; the houſes moſtly of timber, plaſtered and whitened without, or adorned with paintings; the reſt are of freeſtone. That part of the city erected by the noble family of the Fugers, who are lords of the adjacent country, conſiſts of ſeveral ſtreets, built croſs-wiſe, containing 106 houſes; the poor that inhabit them are maintained by an annual penſion. It is ſituated 30 miles N. W. of Munich, and 52 S. of Nuremberg. Lon. 86. 4. E. Lat. 48. 72. N.

AUGUR, *n. s.* one who pretends to predict by omens, as by the flight of birds.

To AUGUR, *v. n.* to gueſs; to conjecture by ſigns.

AUGURY, *n. s.* 1. The act of prognoſticating by omens or prodigies.—2. An omen or prediction.

Augury, FARTHER DEFINITION OF. Augury is more juſtly defined the *art* of foretelling future events, by obſervations taken from the chattering, ſinging, feeding, and flight, of birds. It is alſo uſed, in a more general ſignification, as compriſing all the different kinds of divination.

AUGUST, *adj.* great; grand; royal; magnificent; awful.

AUGUST, *n. s.* the name of the eighth month from January incluſive.

AUGUSTA, a conſiderable and flouriſhing town of Georgia, formerly the ſeat of government. It is pleaſantly ſituated in Richmond county, on the S. W. ſide of Savannah river, upon a beautiful plain 5 miles in length, and one and a half in breadth. It is regularly laid out, the ſtreets interſecting each other at right angles, and contains about 250 dwelling houſes; and according to the laſt cenſus, 2165 inhabitants. The public buildings are a church; an academy; a government houſe, where the governor, ſecretary of ſtate, and other public officers tranſact their buſineſs; a market-houſe; a new ſtone jail; a ſpacious building where the courts of juſtice are adminiſtered, and the legiſlature hold their ſeſſions; and three ware-houſes, large enough to contain 10,000 hogſheads of tobacco. The academy generally contains between 80 and 90 ſtudents, who are under the direction of two tutors and a profeſſor of oratory. It is governed by a board of truſtees, who are a body corporate in law. The funds belonging to this inſtitution, are conſiderable, conſiſting of lands, houſes, and money, to the amount of ſeveral thouſand pounds ſterling. From the advantages which it enjoys, it probably will, on a future day, become a place of conſiderable note in the literary world. Oppoſite the centre of the town, a large wooden bridge has been erected acroſs the Savannah, which opens a commodious and eaſy communication with South-Carolina; it is 19 feet wide, and between 7 and 800 in length. It has already been of conſiderable advantage to the town, by inducing the planters in the upper part of South-Carolina to bring their produce to this market. In 1791, upwards of 6,000 hogſheads of tobacco were inſpected here. It drives on a briſk trade between the back country and the town of Savannah. It was incorporated in 1790, by an act of the legiſlature, and is governed by a mayor and ſeveral aldermen. It has been lately publiſhed, that in 1785, on the ſpot where the town now ſtands, there were not five houſes; and this appears ſomewhat paradoxical, and has a tendency to miſlead the unwary in reſpect to its firſt eſtabliſhment: Mr. Bartram was in it about the year 1773, when there were more than 5 houſes there. The buildings, ſays he, are near the bank of the river, and extend nearly two miles, up to the falls. The houſes which have been erected ſince 1785, ſtand three miles below the falls, the inhabitants gradually moving down ſince that period, as the preſent ſituation was found more eligible. A federal diſtrict court is held here the 2d Tueſday in November, and a circuit court the 8th of that month. It is about 250 miles from the mouth of Savannah river, including its meanders, 120 N. N. W. of Savannah, and 746 S. W. by S. of Philadelphia. Lon. 5. 42. W. Lat. 33. 39. N.

AUGUSTA, the ſhire town in the county of Kennebeck, and diſtrict of Maine, including the N. part of Hallowell, it was lately taken from that county, and extends on both ſides of the river Kennebeck, and is 196 miles from Boſton, and 539 from Philadelphia.

AUGUSTA, a county in Virginia, length 40 miles, breadth 32; bounded by Rockingham on the N. E. by Bath on the W. by the Blue Ridge on the S. E. and on the S. W. by Rockbridge. The population, according to the late cenſus, was about 11,712.

AUGUSTINE, CAPE ST. Lat. 8. 30. S. Long. 39. 20. E. on the Coaſt of Brazil, on the Atlantic Ocean, 300 miles N. E. from the Bay of All Souls.

AUGUSTINES SQUARE, ST. a number of ſmall iſlands on the Coaſt of Labrador, in the Gulph of St. Lawrence, the largeſt of which are Sheeatica Bay, on the N. E. to Outer I. S. W. viz. Large, Sandy, and Outer Iſlands. Theſe are near the mouth of St. Lawrence.

AUGUSTINES, ST. N. Lat. 51. 10. E. Long. from Philadelphia, 16. 10. a port and river on the Coaſt of Labrador, near the Straits of Belliſle, and oppoſite St. Johns Bay, Newfoundland. There are two ſmall iſlands in the harbour; and about two miles S. W. runs a chain of little iſlands called St. Auſtine's Chain, the outermoſt of which is a remarkable ſmooth rock. It is about 25 miles from Great Mecatina.

AUGUSTINE, ST. the chief town of E. Florida, and ſituated on the ſea coaſt about 80 leagues from the mouth of the Gulph of Florida, N. Lat. 30. W. Long. from Philadelphia, 6. 30. 180 miles E. from St. Mark's, and 316 S. W. from Charleſton in S. Carolina. It is of an oblong figure, and interſected by four ſtreets, which cut each other at right angles, containing 300 dwellings. The town is well fortified, and the breakers at the entrance of the harbour, have formed two channels, whoſe bars have eight feet of water each.

AVICENNIA, or AVICENIA, EASTERN ANACARDIUM, a genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ.* The calyx is quinquepartite; the corolla is bilabiated, the upper lip ſquared; the capſule is leathery, romb-like, and monoſpermous. There are two ſpecies, viz.

1. AVICENNIA NITIDA, the ſhining eaſtern anacardium; and,

2. AVICENNIA TOMENTOSA, the downy anacardium.

AVIGNON, a city of France, in the department of Venaiſſin, and ſeated on the banks of the Rhone. Before the revolution it was ſubject to the pope; and the reſidence of ſeveral of them in it had rendered it conſiderable. This occaſioned many of the natives to be enemies to the new government; eſpecially after the Convention had aboliſhed the eſtabliſhment of the Roman Catholic religion in France; and was the cauſe of much bloodſhed in the beginning of the revolution, in Avignon. It is now, however, completely annexed to the republic. Near the Rhone there is a large rock, within the circumference of the walls, upon which is a platform, whence may be had a proſpect of the whole city and its environs. It is about three miles and two furlongs in circumference, and is in general ill built, irregular, and void of beauty. But it is ſurrounded by handſome battlements and turrets, not unlike thoſe of Rome; and its public edifices are large, ſolid, and grand, as the taſte of the 4th century could make them. Several popes and anti-popes, who during their lives ſhook the Romiſh church with violence, repoſe quietly near each other, in this city. The church of the Cordeliers contains, in an obſcure corner, the almoſt defaced tomb of Petratch's Laura ard her huſband Hugh de Sade; and nearly oppoſite is the tomb of the brave Gullon, ſo well known for his invincible courage, and inviolable attachment to Henry IV. Many productions of Rere of Anjou are to be ſeen in the city. Its inhabitants amount to 30,000, of whom ſome hundreds are Jews. The palace, formerly poſſeſſed by the pope's legate, is compoſed of ſeveral large ſquare towers, and the hall is full of fine paintings, as well as the chapel and apartments. The arſenal is near the palace. The church of Notre Dame is ancient, but not large, and is one of the beſt adorned in the city. The paintings are equal to the fineſt in Italy. The great altar is very magnificent, and is adorned with a ſhrine that contains the relics of many ſaints. The treaſure of the ſacriſty is worthy the curioſity of the traveller. The palace where the ci-devant archbiſhop reſided, is formed of three bodies of lodgings, with courts and ſmall pavilions. It overlooks the Rhone, the city and the fields. Theſe buildings and the mint adorn a large ſquare, which is the common walk of the inhabitants. In Avignon they reckon ſeven gates, ſeven palaces, ſeven colleges, ſeven hoſpitals, and ſeven popes who have lived there within 70 years; and before the revolution, it had ſeven monaſteries and ſeven nunneries. The ſteeples are numerous; and one of them had a bell of ſilver (probably melted during the revolution,) which was rung only on the death of a pope. The church of the Celeſtines is very magnificent, and full of fine monuments, and the reſt are not without their curioſities. The univerſity has four colleges. Under the old deſpotiſm, the Jews lived in a diſtinct quarter, from whence they durſt not ſtir out without yellow hats or head dreſſes to diſtinguiſh them from the Chriſtians! Their number was very conſiderable, in a very confined place, where the only way they had of enlarging their abodes was by building their houſes higher; and they were forced to hear a monk preach a ſermon every week. From theſe and other oppreſſions, the revolution has delivered that much perſecuted people. Acroſs the Rhone, extend the ruinous and decayed arches of that bridge, againſt which Madame de Grignan was ſo near being loſt, and of which Madame de Sevigne makes terrific mention. It was demoliſhed in 1699, by one of the inundations common to the Rhone. When entire, it was not leſs than a quarter of a mile in length; but being ſo narrow as not to permit two carriages to paſs in any part, it had previouſly become almoſt uſeleſs. A new bridge will probably ſoon be built, as the narrow motives of policy which hitherto prevented it, now no longer exiſt. Below the bridge, there is an iſland where the Sorgues joins the Rhone. Avignon is 20 miles S. of Orange, and 20 E. of Niſmes. Long. 79. 53. E. Lat. 42. 57. N.

Avignon, a territory of France in one of the new departments, which has been ſubject to the popes, but is now incorporated with the republic. In the laſt London edition of Guthrie's Grammar, (by Dilly and Robiſons, 1795,) it is placed, along with Venaiſſin, in the department of *Corſica*; which ſeems to be founded upon a *fictio juris*, ſimilar to that in the Engliſh law, which, before the revolution of America, ſuppoſed the whole Britiſh American colonies to lie in the county of Lancaſhire! It would ſeem alſo to indicate that the French ſtill expect to recover Corſica, either by conqueſt, revolt, or negociation. According to the ancient diviſion of France, it was moſtly ſurrounded by Provence. Avignon was the capital. It is extremely fertile, being watered by the Sorgues, which takes its riſe from the fountain of Vaucluſe, whither the celebrated Petrarch often retired to indulge his love-ſick melancholy. See Petrarch and Vaucluse.

Avignon berry, the fruit of a ſpecies of lycium, which grows plentifully near Avignon and in other parts of France. The berry is ſomewhat leſs than a pea; its colour is green, approaching towards a yellow, and it is of an aſtringent and bitter taſte.—It is much uſed by the dyers, who ſtain a yellow with it; and by the painters, who alſo make a fine golden yellow of it.

AVILLA, a city of Spain in Old Caſtile, ſeated on an eminence on the banks of the river Adaja, and in ſight of the mountains of Pico. It is fortified both by nature and art, having a wall 9075 feet in circumference, adorned with 26 lofty towers, and 10 handſome gates. There are 17 principal ſtreets, the houſes of which are generally good and ſtately. It hath 2000 houſes, nine ſquares; nine pariſhes, nine hoſpitals, nine monaſteries, 18 chapels, ſeven nunneries, two colleges, and an allowance or 10,000 ducats yearly for the maintenance of orphans and other poor people. It has an univerſity, and a conſiderable biſhopric; beſides a noble cathedral, which has eight dignitaries, 20 canons, and the ſame number of minor canons. It ſtands in the middle of a fine large plain, ſurrounded with mountains, and covered with fruit trees and vineyards. There is likewiſe a manufacture of cloth. Long. 70. 25. E. Lat. 40. 40. N.

AVOCATION, *n. s.* 1. The act of calling aſide.—2. The buſineſs that calls; or the call that ſummons away.

To AVOID, *v. a.* 1. To ſhun; to decline.—2. To eſcape.—3. To endeavour to ſhun.—4. To evacuate; to quit.—5. To emit; to throw out.—6. To oppoſe; to hinder effect.—7. To vacate; to annul.

To Avoid, *v. n.* 1. To retire.—2. To become void or vacant.

AVOIDABLE, *adj.* 1. That which may be avoided, ſhunned, or eſcaped.—2. Liable to be vacated or annulled.

AVOIDANCE, *n. s.* 1. The act of avoiding.—2. The courſe by which any thing is carried off.—3. The act or ſtate of becoming vacant.—4. The act of annulling.

AVOIDER, *n. s.* 1. The perſon who avoids or ſhuns any thing.—2. The perſon who carries any thing away.—3. The veſſel in which things are carried away.

AVOIDLESS, *adj.* inevitable; that which cannot be avoided.

AVOIRDUPOIS, *n. s.* a kind of weight, of which a pound contains ſixteen ounces, and is in proportion to a pound Troy, as ſeventeen to fourteen. All the larger and coarſer commodities are weighed by *avoirdupois* weight.

Avoirdupois ounce is leſs than the Troy ounce in the proportion of 700 to 768: but the

Avoirdupois pound is greater than the Troy pound in the proportion of 700 to 576.

To AVOUCH, *v. a.* 1. To affirm; to maintain; to declare peremptorily.—2. To produce in favour of another.—3. To vindicate; to juſtify.

AVOUCHABLE, *adv.* that may be avouched.

AVOUCHER, *n. s.* he who avouches.

To AVOW, *v. a.* to declare with confidence; to juſtify; not to diſſemble.

AVOWABLE, *adv.* that which may be openly declared; that which may be declared without ſhame.

AVOWAL, *n. s.* juſtificatory declaration; open declaration.

AVOWEDLY, *adv.* in an open manner.

AVOWER, *n. s.* he who avows or juſtifies.

AVOWRY, *n. s.* in law, is where one takes a diſtreſs for rent, or other thing, and the other ſues replevin. In which caſe the taker ſhall juſtify, in his plea, for what cauſe he took it; and if he took it in his own right, is to ſhew it, and ſo avow the taking, which is called his *avowry*.

AVOWSAL, *n. s.* a confeſſion.

AVOWTRY, *n. s.* adultery.

AURA, in chemiſtry, a certain fine and pure ſpirit, found in every animal or vegetable body; but ſo ſubtle, as only to be perceptible by its ſmell and taſte, or other effects, not found in any other body. This aura, ſays Boerhaave, exhibits the proper character of the body, and is lodged in the oil of the body, to prevent its being diſſipated and thrown off.

Aura, in ornithology, a ſpecies of vulure.

AVRANCHES, an ancient city of France, in the department of the Channel, ſeated on an eminence, near which the river See runs about a mile and a half from the ocean. The cathedral ſtands on a hill, which terminates abruptly; the front of the church extending to the extreme verge of it, and overhanging the precipice. It bears the marks of high antiquity; but the towers are decayed in many places, though its original conſtruction has been wonderfully ſtrong. In this town Henry II. of England received abſolution from the Papal nuncio, for the murder of St. Thomas A. Becket, in 1172; and the ſtone on which he knelt during the performance of that ceremony, about 30 inches in length, and 12 in breadth, ſtands before the north portal; with an engraving in commemoration of the event.—The ruins of the caſtle of Avranches are very extenſive; and beneath lies a rich extent of country, abounding in grain and covered with orchards, from the fruit of which is made the beſt cider in Normandy. It is 30 miles E. of Malo. Long. 74. 20. E. Lat. 48. 51. N.

AUREA Alexandrina, in pharmacy, a kind of opiate, or antidote againſt the colic and apoplexy, compoſed of a great number of ingredients, which was in great fame among the ancient writers. It is called aurea, from the gold (*aurum*) which is an ingredient in its compoſition; and Alexandrina, as having been invented by a phyſician named Alexander.

AURELIA, *n. s.* a term uſed for the firſt apparent change of the eruca, or maggot of any ſpecies of inſects.

Aurelia, in natural hiſtory, the ſame with what is uſually called *chryſalis*, and ſometimes *nymph*.

Aurelia, the ancient name of Orleans.

AURELIANA, in botany, a name given by ſome to a ſpecies of Panax.

AURICLE, *n. s.* 1. The external ear, or that part of the ear which is prominent from the head.—2. Two appendages of the heart; being two muſcular caps, covering the two ventricles thereof; thus called from the reſemblance they bear to the external ear.

AURICULA, *n. s.* See Bears Ear. A flower.

Auricula Judæ, or Jew's ear, a kind of *fungus*, or muſhroom, ſomewhat reſembling, in figure, a human ear. It grows on elder trees, the tree on which, as ſome pretend, Judas hanged himſelf; and hence, they think, the name is derived. This fungus ſteeped in water, and applied to the eyes, is ſaid to free them of inflammations; but its chief uſe is in the form of a gargle in decoctions, againſt inflammations of the throat, or ſwellings of the tonſils.

AURICULAR, *n. s.* 1. Within the ſenſe or reach of hearing.—2. Secret; told in the ear; as, *auricular* confeſſion.—3. Traditional; known by report.

AURICULARLY, *adv.* in a ſecret manner.

AURICULATED leaf, in botany, is a leaf which has a lobe on each ſide towards the baſe.

AURIFEROUS, *adj.* that which produces gold.

AURIGA, the waggoner, in aſtronomy, a conſtellation of the northern hemiſphere, conſiſting of 23 ſtars, according to Tycho; 40, according to Hevelius; and 68, in the Britannic catalogue.

AURIS, the ear. See Anatomy.

Auris asini, aſs-ears, a name given by naturaliſts, to a ſpecies of ſea-ſhell, ſuppoſed to reſemble the ear of an aſs.

Auris externa, the auricle.

Auris marina, ear-ſhell.

Auris porci, hog's ear, in natural hiſtory, a ſea-ſhell, a ſpecies of the murex.

AURISCALPUM, an inſtrument to clean the ears, and ſerving alſo for other operations in diſorders of that part.

AURORA, *n. s.* 1. A ſpecies of crowfoot.—2. The goddes that opens the gates of day.

Aurora, in the mythology, the goddeſs of the morning, was the daughter of Hyperion and Theia, according to Heſiod.

Aurora, is alſo uſed for the morning twilight, or that faint light which appears in the morning when the ſun is within 18° of the horizon.

Aurora, one of the New Hebrides iſlands in the South Sea, in which Mr. Forſter ſuppoſes the *Peak d'Etoil* mentioned by Mr. Bouganville to be ſituated. The iſland is inhabited; but none of its inhabitants came off to viſit Capt. Cook. The country is woody, and the vegetation ſeemed to be exceſſively luxuriant. It is about 12 leagues long, but not above 5 miles broad in any part; lying nearly north and ſouth. The middle lies in Lon. 168. 24. E. Lat. 15. 6. S.

Aurora australis, southern light, or streamers, ſimilar to the Aurora Borealis, or Northern Light, only more clear and white.

Aurora borealis, northern twilight, or *Streamers*; a kind of meteor appearing in the northern parts of the heavens, moſtly in the winter time, and in froſty weather. It is now ſo generally known, that no deſcription is requiſite of the appearance which it uſually makes. But it is in the arctic regions that it appears moſt remarkable, particularly during the ſolſtice. In the Shetland iſlands, the *merry dancers*, as they are there called, are the conſtant attendants of clear evenings. They commonly appear at twilight near the horizon, of a dun colour, approaching to yellow; ſometimes continuing for ſeveral hours without any ſenſible motion; after which they break out into ſtreams of ſtronger light, ſpreading into columns, and altering ſlowly into ten thouſand different ſhapes, varying their colours from all the tints of yellow to the obſcureſt ruſſet. They often cover the whole hemiſphere, and then make the moſt brilliant appearance. Their motions at theſe times are moſt amazingly quick; and they aſtoniſh the ſpectator with the rapid change of their form. They break out in places where none were ſeen before, darting along the heavens; are ſuddenly extinguiſhed, and leave behind an uniform duſky tract. This again is brilliantly illuminated in the ſame manner, and as ſuddenly left a dull blank. Sometimes they aſſume the appearance of vaſt columns, on one ſide of the deepeſt yellow, on the other declining away till it becomes undiſtinguiſhable from the ſky. They have generally a tremulous motion from end to end, which continues till the whole vaniſhes. In a word, we, who only ſee the extremities of theſe northern phenomena, have but a faint idea of their ſplendor and their motions. According to the ſtate of the atmoſphere, they differ in colours. They often put on the colour of blood, and make a dreadful appearance. The ruſtic ſages become prophetic, and terrify the gazing ſpectators with the dread of war, peſtilence, and famine. This ſuperſtition was not peculiar to the northern iſlands; nor are theſe appearances of a recent date. The ancients called them *Chasmata*, and *Trabes*, and *Bolides*, according to their forms or colours. The Aurora Borealis in this country, appears uſually of a reddiſh colour, inclining to yellow, and ſends out frequent coruſcations of pale light, which ſeem to riſe from the horizon in a pyramidal undulating form, and ſhooting with great velocity up to the zenith. They appear often in the form of an arch, which is partly bright, and partly dark, but generally tranſparent: And the matter of them is not found to have any effect on the rays of light, which paſs freely through them. Dr. Hamilton obſerves, that he could plainly diſcern, the ſmalleſt ſpeck in the Pleiades through the denſity of thoſe clouds which formed part of the aurora borealis in 1763, without the leaſt diminution of its ſplendour, or increaſe of twinkling. Sometimes it produces an iris; and hence, M. Godin judges, that moſt of the extraordinary meteors and phænomena in the ſkies, related as prodigies by hiſtorians, as battles, and the like, may probably enough be reduced to the claſs of aurora borealis. This kind of meteor never appears near the equator; but, it ſeems, is frequent enough towards the ſouth pole, like as towards the north, having been obſerved there by voyagers. See Philoſ. Tranſ. N° 461, and vol. 54; alſo Forſter's account of his voyage round the world with Captain Cook, where he deſcribes their appearance as obſerved for ſeveral nights together, in ſharp froſty weather, which was much the ſame as thoſe obſerved in the north, excepting that they were of a lighter colour. Meteors of this kind have appeared more frequently at ſome periods than others; whence it would ſeem, that the air, or earth, or both, are not at all times diſpoſed to produce this phænomenon. The extent of theſe are alſo amazingly great. That which occurred in March, 1716, was viſible from the W. of Ireland to the confines of Ruſſia and the E. of Poland; extending at leaſt near 30 degrees of longitude, and from about the 50th degree of latitude, over almoſt all the N. of Europe; and in all places, at the ſame time, it exhibited the like wondrous appearances. Father Boſcovich has determined the height of an aurora borealis, which was obſerved by the Marquis of Polini the 16th of December, 1737, and found it was 825 miles high; and Mr. Bergman, from a mean of 30 computations, makes the average height of the aurora borealis amount to 70 Swediſh, or 469 Engliſh miles. But Euler ſuppoſes the height to be ſeveral thouſands of miles; and Mairn alſo aſſigns to them a very elevated region.

Aurora borealis, causes of the. Many attempts have been made to determine the cauſe of this phænomenon. Dr. Halley imagines that the vapours, or effluvia, exceedingly rarefied by ſubterraneous fires, and tinged with ſulphureous ſtreams, which many naturaliſts have ſuppoſed to be the the cauſe of earthquakes, may alſo be the cauſe of this appearance; or that it is produced by a kind of ſubtile matter, freely pervading the pores of the earth, and which, entering into it nearer the ſouthern pole, paſſes out again with ſome force into the æther, at the ſame diſtance from the northern. This ſubtile matter, by becoming more denſe, or having its velocity increaſed, may perhaps be capable of producing a ſmall degree of light, after the manner of effluvia from electric bodies, which, by a ſtrong and quick friction, emit light in the dark; to which ſort of light this ſeems to have an affinity. On this ſubject ſee Philoſ. Tranſ. N° 347; and alſo Mr. Cotes's deſcription of this phænomenon, and his method of explaining it, by ſtreams emitted from the heterogeneous and fermenting vapours of the atmoſphere, in Smith's optics, p. 69. The celebrated M. de Mairan, in an expreſs treatiſe, on the Aurora Borealis, publiſhed in 1731, ſuppoſes its cauſe to be the zodiacal light, which according to him, is no other than the ſun's atmoſphere; this light happening, on ſome occaſions, to meet the upper part of our atmoſphere about the limits where univerſal gravity begins to act more forcibly towards the earth than towards the ſun, falls into our air to a greater or leſs depth, as its ſpecific gravity is greater or leſs, compared with the air through which it paſſes. However, Mr. Euler thinks the cauſe of the aurora borealis not owing to the zodiacal light, as M. de Mairan ſuppoſes: but to particles of our atmoſphere, driven beyond its limits by the impulſe of the ſolar light. And on this ſuppoſition he endeavours to account for the phænomena obſerved concerning this light. He ſuppoſes the zodiacal light, and the tails of comets, to be owing to a ſimilar cauſe. But ever ſince the identity of lightning and the electric matter has been determined, philoſophers have been naturally led to ſeek for the explication of ærial meteors in the principles of electricity; and there is now no doubt but moſt of them, and eſpecially the aurora borealis, are electrical phænomena. Beſides the more obvious and known appearances which conſtitute a reſemblance between this meteor and the electric matter by which lightning is produced, it has been obſerved that the aurora occaſions a very ſenſible fluctuation in the magnetic needle; and that when it has extended lower than uſual in the atmoſphere, the flaſhes have been attended with various ſounds of rumbling and hiſſing, eſpecially in Ruſſia and the other more northern parts of Europe; as noticed by Sig. Beccaria and M. Meſſier. Mr. Canton, ſoon after he had obtained electricity from the clouds, offered a conjecture, that the aurora is occaſioned by the daſhing of electric fire poſitive towards the negative clouds at a great diſtance, through the upper part of the atmoſphere, where the reſiſtance is leaſt: and he ſuppoſes that the aurora which happens at the time when the magnetic needle is diſturbed by the heat of the earth, is the electricity of the heated air about it: and this appears chiefly in the northern regions, as the alteration in the heat of the air in thoſe parts is the greateſt. Nor is this hypotheſis improbable, when it is conſidered, that electricity is the cauſe of thunder and lightning; that it has been extracted from the air at the time of the aurora borealis; that the inhabitants of the northern countries obſerve it remarkably ſtrong, when a ſudden thaw ſucceeds very cold ſevere weather; and that the tourmalin is known to emit and abſorb the electric fluid only by the increaſe and diminution of its heat. Poſitive and negative electricity in the air, with a proper quantity of moiſture to ſerve as a conductor, will account for this and other meteors, ſometimes ſeen in a ſerene ſky. Mr. Canton has ſince contrived to exhibit this meteor by means of the Torricellian vacuum, in a glaſs tube about three feet long, and ſealed hermetically. When one end of the tube is held in the hand, and the other applied to the conductor, the whole tube will be illuminated from end to end, and will continue luminous without interruption for a conſiderable time after it has been removed from the conductor. If, after this, it be drawn through the hand either way, the light will be remarkably intenſe through the whole length of the tube. And though a great part of the electricity be diſcharged by this operation, it will ſtill flaſh at intervals, when held only at one extremity, and kept quite ſtill; but if, at the ſame time, it be graſped by the other hand in a different place, ſtrong flaſhes of light will dart from one end to the other; and theſe will continue 24 hours or more, without a freſh excitation. Sig. Beccaria conjectures that there is a conſtant and regular circulation of the electric fluid from north to ſouth; and he thinks that the aurora borealis may be this electric matter performing its circulation in ſuch a ſtate of the atmoſphere as renders it viſible, or approaching nearer than uſual to the earth; though probably this is not the mode of its operation, as the meteor is obſerved in the ſouthern hemiſphere, with the ſame appearances as in the northern. Dr. Franklin ſuppoſes, that the electric fire diſcharged into the polar regions, from many leagues of vaporiſed air raiſed from the ocean between the tropics, accounts for the aurora borealis; and that it appears firſt, where it is firſt in motion, namely, in the moſt northern part; and the appearance proceeds ſouthward, though the fire really moves northward. Mr. Kirwan, in the Tranſactions of the Royal Iriſh Academy, ann. 1788, has alſo ſome ingenious remarks on the *aurora borealis & auſtralis.* He gives his reaſons for ſuppoſing the rarefaction of the atmoſphere in the polar regions to proceed from them, and theſe from a combuſtion of inflammable air cauſed by electricity. He obſerves, that after an aurora borealis the barometer commonly falls, and high winds from the ſouth generally follow.

Aurora Borealis, history of the. The only thing that reſembles a diſtinct hiſtory of this phenomena, is what we have from Dr. Halley, (*Phil. Trans.* No. 347.) The firſt account he gives, is of the appearance of what is called by the author *burning ſpears*, and was ſeen at London on January 30th, 1560. This account is taken from a book, intitled, *A deſcription of Meteors*, by *F. W.* D. D. and reprinted at London in 1654. The next appearance, on the teſtimony of Stow, was on October 7th, 1564. In 1574 alſo, according to Camden, and Stow above mentioned, an aurora borealis was obſerved two nights ſucceſſively, viz. on the 14th and 15th of November, with much the ſame appearance as deſcribed by Dr. Halley in 1516, and which we now ſo frequently obſerve. Again, the ſame was twice ſeen in Brabant, in 1575; viz. on the 13th of February and 28th of September. Its appearances at both theſe times were deſcribed by Cornelius Lemma, profeſſor of medicine in the univerſity of Lovain, who compares them to ſpears, fortified cities, and armies fighting in the air. After this, Michael Mæſtlin tutor of the great Kepler, aſſures us, that at Baknang in the county of Wurtemberg, in Germany, theſe phenomena, which he ſtyles *chasmata*, were ſeen by himſelf no leſs than ſeven times in 1580. In 1581, they again appeared in an extraordinary manner in April and September, and in a leſs degree at ſome other times of the ſame year. In 1621, September 2d, this phenomenon was obſerved all over France, and deſcribed by Gaſſendus, who gave it the name of **Aurora Borealis**: yet neither this, nor any ſimilar appearances poſterior to 1574, are deſcribed by Engliſh writers till 1707; which, as Dr. Halley obſerves, ſhows the prodigious neglect of curious matters which at that time prevailed. From 1621 to 1707, indeed, there is no mention made of an aurora borealis being ſeen by any body: and conſidering the number of aſtronomers, who during that period were in a manner continually poring on the heavens, we may very reaſonably conclude that no ſuch thing did make its appearance till after an interval of 86 years. In 1707, a ſmall one was ſeen in November; and during that year and the next, the ſame appearances were repeated five times. The next on record is that mentioned by Dr. Halley in March 1715-16, the brilliancy of which attracted univerſal attention, and by the vulgar was conſidered as marking the introduction of a foreign race of princes. Since that time thoſe meteors have been ſo common, that no accounts have been kept of them. It was for a long time a matter of doubt whether this meteor made its appearance *only* in the northern hemiſphere, or whether it was alſo to be obſerved near the *south* pole. This is now aſcertained by Mr. Foſter; who in his late voyage round the world with Captain Cook, aſſures us, that he obſerved them in the high ſouthern latitudes, though with phenomena ſomewhat different from thoſe which are ſeen here. On Feb. 17, 1773, as they were in Lat. 58° ſouth, "A beautiful phenomenon (ſays he) was obſerved during the preceding night, which appeared again this and ſeveral following nights. It conſiſted of long columns of a clear white light, ſhooting up from the horizon to eaſtward, almoſt to the zenith, and gradually ſpreading on the whole ſouthern part of the ſky. Theſe columns were ſometimes bent ſidewiſe at their upper extremities; and though in moſt reſpects ſimilar to the northern lights (*auroræ boreales*) of our hemiſphere, yet differed from them in being always of a whitiſh colour, whereas ours aſſume various tints, eſpecially thoſe of a fiery and purple hue. The ſky was generally clear when they appeared, and the air ſharp and cold, the thermometer ſtanding at the freezing point." Theſe Mr. Kirwan denominates *Aurora Auſtralis.*

Aurora Borealis, prognostics drawn from the. In a paper preſented to the Royal Society, by Mr, Winn, in 1772, he ſays that the appearance of an aurora borealis is a certain ſign of an hard gale of wind from the S. or S. W. This he never found to fail in 23 inſtances; and even thinks, that from the ſplendour of the meteor, ſome judgment may be formed concerning the enſuing tempeſt. If the aurora is very bright, the gale will come on within 24 hours, but will be of no long duration; if the light is faint and dull, the gale will be leſs violent, and longer in coming on, but will alſo laſt longer. His obſervations were made in the Engliſh channel, where ſuch winds are very dangerous; and by attending to the auroræ, he often got eaſily out of it, when others narrowly eſcaped being wrecked. This is an exceeding uſeful obſervation for ſailors: but it cannot be expected that the winds ſucceeding theſe meteors ſhould in all places blow from the S. W. though no doubt a careful obſervation of what winds ſucceeded the aurora borealis, and other meteors, in different parts of the world, might contribute in ſome meaſure to leſſen the dangers of navigation. That the aurora borealis ought to be ſucceeded by winds, may be eaſily deduced from the hypotheſis above mentioned. If this phenomenon is occaſioned by the vaſt quantity of electric matter conveyed to the equatorial parts of the earth, it is certain that the earth cannot receive any great quantity of this matter at one place without emitting it at another. The electricity, therefore, which is conſtantly received at the equator, muſt be emitted nearer the poles, in order to perform its courſe, otherwiſe there could not be a conſtant ſupply of it for the common operations of nature. It is obſerved, that electrified bodies are always ſurrounded by a blaſt of air, which is ſent from them in different directions; hence, if the electric matter find a more ready paſſage through one part of the earth than another, a wind will be found to blow from that quarter. If therefore one of theſe places happens to be in the Atlantic ocean near the coaſt of France, or in the bay of Biſcay, the electric matter which has been received at the equator during an aurora borealis will be diſcharged there ſome time after, and conſequently a wind will blow from that quarter, which will be from the S. W. to thoſe ſhips which are in the Engliſh channel. It cannot be imagined, however, that all the matter can be diſcharged from one place; and therefore according to the different ſituations of thoſe electric vents, winds may blow in different directions; and thus the ſame aurora borealis may produce a S. W. wind in the Engliſh channel. and a N. W. one in Scotland.

Aurora Borealis, light ſtreamers in the night from the north.

Aurora Surgens, in alchymy, a phraſe uſed to expreſs the multiplicative virtue of the philoſophers ſtone.

AURUM, gold. This metal was introduced into medicine by the Arabians, who eſteemed it one of the greateſt cordials and comforters of the nerves. From them Europe received it without any diminution of its character; in foreign pharmacopæias it is ſtill retained, and even mixed with the ingredients from which ſimple waters are to be diſtilled. But no none, it is preſumed, at this time expects any ſingular virtues from it, ſince it certainly is not alterable in the human body. Mr. Geoffry, though unwilling to eject it from the corporal preparations, honeſtly acknowledges that he has no other reaſon for retaining it than complaiſance to the Arabian ſchools. The chemiſts have endeavoured, by many elaborate proceſſes, to extract what they call a ſulphur, *anima* or ſpirit of gold; but no method is as yet known of ſeparating the component parts of this metal: all the tincture of it, and aurum potabile, which have hitherto appeared, are real ſolutions of it in aqua regia, diluted with ſpirit of wine or other liquors, and prove injurious to the body rather than beneficial. A place, however, is now given in ſome of the foreign pharmacopæias to the aurum fulminans; and it has of late been recommended as a remedy in ſome convulſive diſeaſes, particularly in the chorea ſancti viti.

Aurum fulminans, a preparation made by diſſolving gold in aqua regia, and precipitating it with ſalt of tartar; whence a very ſmall quantity of it becomes capable, by a moderate heat, of giving a report like that of a piſtol.

Aurum fulminans is a very dangerous preparation, and ſhould be uſed with great caution. A ſcruple of this powder acts more forcibly than half a pound of gunpowder: a ſingle grain laid on the point of a knife, and lighted at a candle, goes off with a greater noiſe than a muſquet. Dr. Black attributes the increaſe of weight, and the exploſive property of this powder, to adhering fixable air.

Aurum mosaicum, } **Aurum musivum,** } a preparation ſo called from its golden colour, made of mercury, tin, ſal ammoniac, and flowers of ſulphur. It is recommended in moſt chronical and nervous caſes; and particularly convulſions of children.—Its doſe is from four grains to a ſcruple. It is alſo uſed as a pigment, and for mixing with glaſs, to imitate the ſpangles of the lapis luzuli.

Aurum sophisticum, mimic gold, a chemical preparation, made as follows: take fine diſtilled verdigriſe eight ounces, crude Alexandrian tutty four ounces, borax twelve ounces, ſalt-petre one ounce and a half; pulveriſe and mix them altogether, tempering them with oil to the conſiſtence of a plaiſter; then put a German crucible into a wind furnace, heat it red hot, and putting your maſs into it, let it be covered, and the furnace filled with coals over the crucible. When the maſs is melted, let it cool of itſelf, then break the crucible, and you will find at the bottom a fine regulus, like gold, weighing about four ounces, which being malleable, may be wrought into any form.

AUSPICE, *n. s.* 1. The omens of any future undertaking drawn from birds.—2. Protection; favour ſhewn.—3. Influence; good derived to others from the piety of their patron.

AUSPICIAL, *adj.* relating to prognoſtics.

AUSPICIOUS, *adj.* 1. Having omens of ſucceſs.—2. Proſperous; fortunate; applied to perſons.—3. Favourable; kind; propitious.—4. Lucky; happy: applied to things.

AUSPICIOUSLY, *adv.* happily; proſperouſly; with proſperous omens.

AUSPICIOUSNESS, *n. s.* proſperity; promiſe of happineſs.

AUSTERE, *adj.* 1. Severe; harſh; rigid.—2. Sower of taſte; harſh.

Austere, implies alſo rough or aſtringent. Thus an auſtere taſte is ſuch a one as conſtringes the mouth or tongue; as that of unripe fruits, harſh wines, vitriol, alum, &c. Auſtere ſubſtances, ſays Mr. Chalmers, differ from Acerb ones, in that they conſtringe the mouth and tongue leſs, and are void of acidity.

AUSTERELY, *adv.* ſeverely; rigidly.

AUSTERENESS, *n. s.* 1. Severity; ſtrictneſs; rigour.—2. Roughneſs in taſte.

AUSTERITY, *n. s.* 1. Severity; mortified life; ſtrictneſs.—2. Cruelty; harſh diſcipline.

AUSTRIA, a circle of the German empire, bounded on the W. by Switzerland; on the N. by Suabia, Bavaria, Bohemia, and Moravia; on the E. by Hungary, and on the S. by Italy and Croatia. Its name is derived from its ſituation; *Ooſt-ryck*, in the German language ſignifying *East Country*, which it is with reſpect to the other provinces of Germany. It belongs to the emperor, as head of the houſe of Auſtria; and contains the archduchy of Auſtria, the duchies of Stiria, Carinthia, Carniola, and Goritia; the county of Tyrol, and the biſhoprics of Brixen and Trent. Its whole population is eſtimated, by profeſſor Zimmerman, at 4,182,000. It comprehends an extent of 34,320 ſquare miles; and lies moſtly between 106° and 110° Long. E. and between 45° and 49° Lat. N.

Austria, an archduchy in the above circle. It excells all the provinces of Germany in the fertility of its ſoil, the richneſs of its paſtures, and the wholeſomeneſs of the air, Auſtria is divided into Upper and Lower, by the river Ens. Vienna is the capital of the Lower, and Lintz of the Upper. Corn, wine, and fruit, are produced in great abundance; and the ſaffron is better than that of the Eaſt-Indies.

AUSTRINE, *adj.* ſouthern; ſoutherly.

AUTHENTICAL, *adj.* not fictitious; being what it ſeems.

AUTHENTICALLY, *adv.* after an authentic manner; with all the circumſtances requiſite to procure authority.

AUTHENTICALNESS, *n. s.* the quality of being authentic; genuineneſs; authority.

AUTHENTICITY, *n. s.* authority; genuineneſs; the being authentic.

AUTHENTIC, *adj.* that which has every thing requiſite to give it authority, as an *authentic* regiſter. It is uſed in oppoſition to any thing by which authority is deſtroyed, as *authentic*, not *counterfeit*. It is never uſed of perſons. Genuine; not fictitious.

AUTHENTICLY, *adv.* after an authentic manner.

AUTHENTICNESS, *n. s.* the ſame with *authenticity*.

AUTHOR, *n. s.* 1. The firſt beginner, or mover of any thing; he to whom any thing owes its original.—2. The efficient; he who effects or produces any thing.—3. The firſt writer of any thing; diſtinct from the *translator* or *compiler*.—4. A writer in general.

AUTHORESS, a female writer.

AUTHORITATIVE, *adj.* 1. Having due authority.—2. Having an air of authority.

AUTHORITATIVELY, *adv.* 1. In an authoritative manner; with a ſhew of authority.—2. With due authority.

AUTHORITATIVENESS, *n. s.* an acting by authority; authoritative appearance.

AUTHORITY, *n. s.* 1. Legal power.—2. Influence; credit.—3. Power; rule.—4. Support; juſtification; countenance.—5. Teſtimony.—6. Weight of teſtimony; credibility; cogency of evidence.

AUTHORIZATION, *n. s.* eſtabliſhment by authority.

To AUTHORIZE, *v. a.* 1. To give authority to any perſon.—2. To make any thing legal.—3. To eſtabliſh any thing by authority.—4. To juſtify; to prove a thing to be right.—5. To give credit to any perſon or thing.

AUTOCRASY, *n. s.* independent power; ſupremacy.

AUTOGRAPHY, *n. s.* a particular perſon's own writing; or the original of a treatiſe, in oppoſition to a copy.

AUTOLOGIST, *n. s.* one who ſpeaks much of himſelf.

AUTOMATICAL, *adj.* belonging to an automaton; having the power of moving itſelf.

AUTOMATON, *n. s.* a machine that hath the power of motion within itſelf, and which ſtands in need of no foreign aſſiſtance.

Automaton may be farther defined, a machine, ſo conſtructed by means of weights, levers, ſprings, wheels, &c. as to move for a conſiderable time, as if it were endued with animal life. According to this definition, clocks, watches, and all machines of that kind, may be ranked as a ſpecies of automata. But the word is moſt commonly applied to ſuch machines, as are made in the form of men and other animals, at the ſame time that their internal machinery is ſo contrived, that they ſeem *voluntarily* to act like the animals they repreſent.

AUTOUR, in natural hiſtory, a ſort of bark which reſembles cinnamon, but is paler and thicker; it is the colour of a broken nutmeg, and full of ſpangles. It comes from the Levant, and is an ingredient in the carmine dye.

AUTUMN, *n. s.* the ſeaſon of the year between ſummer and winter, beginning aſtronomically at the equinox, and ending at the ſolſtice; popularly *autumn* compriſes Auguſt, September, and October.

Autumn begins when the ſun enters Libra. When it ends, winter begins. Several nations have computed their years by autumns; the Anglo-Saxons by winters. Tacitus tells us, the Germans were acquainted with all the other ſeaſons of the year, but had no notion of autumn! The ancient Jews began their civil year in autumn; reckoning that all the fruits of the creation were in perfection at the creation. The modern French, without regarding the principle, have adopted the practice, in their new calendar; their firſt month, Vendemiare, commencing with the equinox. Thus faith and modern philoſophy have for once produced the ſame effect.

Autumn, in painting, is repreſented by a man at perfect age, clothed like the vernal, and girded with a ſtarry girdle; holding in one hand a pair of ſcales equally poiſed, with a globe in each; in the other hand, a bunch of divers fruits. His age denotes the perfection of this ſeaſon; and the balance, that ſign of the zodiac which the ſun enters when our autumn begins.

Autumn, in alchymy, the ſeaſon when the operation of the philoſopher's ſtone is brought to perfection!

AUTUMNAL, *adj.* belonging to autumn; produced in autumn.

Autumnal equinox, the time when the ſun enters the Autumnal Point.

Autumnal point, is that part of the equinox from which the ſun begins to deſcend towards the ſouth pole.

Autumnal signs, in aſtronomy, are the ſigns Libra, Scorpio, and Sagittarius, through which the ſun paſſes during autumn.

AUTUNOIS, a ci-devant diſtrict of France in Burgundy, of which Autun was the capital. It is now comprehended in the department of Saone and Loire.

AUVERGNE, a ci-devant province of France, about 100 miles in length, and 75 in breadth; the capital of which was Clermont. It was bounded on the N. by the Bourbonnois; on the E. by Forez and Velay; on the W. by Limoſin, Quercy, and La Manche; and on the S. by Rovergne and the Cevennes: and was divided into *upper* and *lower*; the latter, otherwiſe called Limagne, is one of the fineſt counties in the world.

AUX, in aſtronomy, ſee Auges. Some uſe *aux* to denote the arch of the ecliptic, intercepted between the firſt point of Aries, and the point wherein the ſun, or a planet, is at its greateſt diſtance from the earth.

AUXESIS, *n. s.* an increaſing; an exornation, when, for amplification, a more grave and magnificent word is put inſtead of the proper word.

AUXILIAR, Auxiliary, *adj.* aſſiſting; helping; confederate.

Auxilar, } *n. s.* helper; aſſiſtant; confederate.
Auxiliar, }

Auxiliary verb, a verb that helps to conjugate other verbs.

Auxiliary verbs, in grammar, are prefixed to other verbs, to form their modes and tenſes. In the Engliſh language, the auxiliary verb *am* ſupplies the want of paſſive verbs. All the modern languages we know of make uſe of auxiliary verbs, becauſe their verbs do not change their terminations as thoſe of the Latin and Greek, to denote the different tenſes or times of being, doing or ſuffering; nor the different moods or manners of their ſignifying: ſo that, to ſupply this defect, recourſe is had to different auxiliary verbs.

AWAIT, *n. s.* ambuſh.

Await, in the old Engliſh ſtatutes, is uſed for what we now call *waylaying*, or lying in *wait*, to execute ſome miſchief.

To Await, *v. a.* 1. To expect; to wait for.—2. To attend; to be in ſtore for.

AWAKE, *adj.* not being aſleep; not ſleeping.

To Awake, *v. a.* 1. To rouſe out of ſleep.—2. To put into new action.

To Awake, *v. n.* to break from ſleep; to ceaſe to ſleep.

AWARD, *n. s.* judgment; ſentence; determination.

Award, in law, the judgment of an arbitrator, or of one who is not appointed by the law a judge, but choſen by the parties themſelves for terminating their difference.

To Award *v. a.* to adjudge; to give any thing by a judicial ſentence.

To Award, *v. n.* to judge; to determine.

AWARE, *adv.* excited to caution; vigilant; in a ſtate of alarm; attentive.

To Awake, *v. n.* to beware; to be cautious.

AWAY, *adv.* 1. In a ſtate of abſence; not in any particular place.—2. From any place or perſon.—3. Let us go.—4. Begone.—5. Out of one's own hands; into the power of ſomething elſe.—6. It is often uſed with a verb; as, to *drink away* an eſtate; to *idle away* a manor; that is, to drink or idle till an eſtate or manor is gone.—7. On the way; on the road.—8. Perhaps the phraſe *he cannot away with*, may mean *he cannot travel with; he cannot bear the company*.—9. *Away with.* Throw away; take away.

AWE, *n. s.* reverential fear; reverence.

To Awe, *v. a.* to ſtrike with reverence or fear; to keep in ſubjection.

AWFUL, *adj.* 1. That which ſtrikes with awe, or fills with reverence.—2. Struck with awe; timorous; ſcrupulous. This ſenſe occurs but rarely.

AWFULLY, *adv.* in a reverential manner.

AWFULNESS, *n. s.* 1. The quality of ſtriking with awe; ſolemnity; 2. The ſtate of being ſtruck with awe.

AWHILE, *adv.* ſome time; ſome ſpace of time.

AWKWARD, *adj.* 1. Inelegant; unpolite; untaught; ungenteel.—2. Unready; unhandy; not dexterous; clumſy.—3. Perverſe; untoward.

AWKWARDLY, *adv.* clumſy; unreadily; inelegantly; ungainly.

AWKWARDNESS, *n. s.* inelegance; want of gentility; oddneſs; unſuitableneſs.

AWL, *n. s.* a pointed inſtrument to bore holes.

Awls, among ſhoemakers, are uſually a little flat and bended in the blade, and the point ground to an acute angle.

AWLESS, *adj.* 1. Wanting reverence; void of reſpectful fear.—2. Wanting the power of cauſing reverence.

AWN, *n. s.* the beard growing out of the corn or graſs.

AWNING, *n. s.* a cover ſpread over a boat, or veſſel, to keep off the weather.

AWOKE, the preterite from *awake*.

AWORK, *adv.* on work; into a ſtate of labour; into action.

AWORKING, *adj.* into the ſtate of working.

AWREAKED, wreaked; revenged.

AWRY, *adv.* 1. Not in a ſtrait direction; obliquely.—2. Aſquint; with oblique viſion.—3. Not in a right or true direction.—4. Not equally between two points; unevenly.—5. Not according to right reaſon; perverſely.

AXAYACATL, a ſpecies of fly, common about the Lake of Mexico; the eggs of which being depoſited in immenſe quantities, upon the ruſhes and corn-flags, from large maſſes, which are taken up by fiſhermen and carried to market for ſale. This caviare, called *ahuauhtli*, which has much the ſame taſte with the caviare of fiſh, uſed to be eat by the Mexicans, and is now a common diſh among the Spaniards. The Mexicans eat not only the eggs, but the flies themſelves, made up together into a maſs, and prepared with ſaltpetre.

AXE, *n. s.* an inſtrument conſiſting of a metal head, with a ſharp edge, fixed in a helve or handle, to cut with.

Axe, or Ax, differs from the hatchet, in that it is made larger and heavier, to hew large ſtuff; and its edge tapering into the middle of its blade. It is furniſhed with a long handle, being to be uſed with both hands.

AXILLA, *n. s.* the cavity under the upper part of the arm, called the arm-pit.

Axilla, in botany, is the ſpace comprehended between the ſtems of plants and their leaves. Hence we ſay, thoſe flowers grow in the axilla of the leaves; i. e. the baſe of the leaves or juſt within the angles of their pedicles.

AXILLAR, } *adj.* belonging to the arm-pit.
AXILLARY, }

Axillary artery is that part of the ſubclavian branch of the aſcending trunk of the aorta which paſſeth under the arm-pits.

Axillary glands are ſituated under the arm-pits, enveloped in fat, and lie cloſe by the axillary veſſels.

Axillary nerve, called alſo the *auricular nerve*, ariſes from the laſt two cervical pairs; runs into the hollow of the axilla, behind the head of the *os humeri*, between the *musculus teres major* and *minor*, &c.

Axillary vein, is one of the ſubclavian veins; which, paſſing under the arm-pits, divides itſelf into ſeveral branches; *superior*, *inferior*, *external*, *internal*, &c. which are ſpread over the arm.

Axillary vertebra, the ſecond vertebra of the back, ſo called becauſe it is neareſt to the arm-pits.

AXIM, a ſmall territory of Africa, on the Gold Coaſt. The climate is ſo exceſſively moiſt, that it is proverbially ſaid to rain 11 months and 29 days of the year. This exceſſive moiſture renders it very unhealthy; but it produces great quantities of rice, water melons, lemons, oranges, &c. Here are alſo produced vaſt numbers of black cattle, goats, ſheep, pigeons, &c. The whole country is filled with beautiful and populous villages, and the intermediate lands are well cultivated. The natives all go naked, although they are very wealthy, from the conſtant traffic carried on with them by the Europeans for their gold. This canton is a kind of republic, the government being divided between the Caboceroes, or chieg men, and Manaceroes or young men.—But in their courts there is not even a pretence of juſtice; whoever makes the moſt valuable preſents to the judges is ſure to gain his cauſe, the judges themſelves alledging the gratitude due for the bribes received as a reaſon; and if both parties happen to make preſents of nearly equal value, they abſolutely refuſe to give the cauſe a hearing.

Axim, or **Achombone**, the capital of **Axim**, ſtands under the cannon of the Dutch fort St. Antonio. Behind it is ſecured by a thick wood that covers the whole declivity of a neighbouring hill. Between the town and the ſea runs an even and ſpacious ſhore of beautiful white ſand. All the houſes are ſeparated by groves of cocoa and other fruit trees, planted in parallel lines, each of an equal width, and forming an elegant viſta. The coaſt is defended by a number of ſmall pointed rocks, which project from the ſhore, and render all acceſs to it dangerous. Long. 51. 0. E. Lat. 5. 4. N.

AXIOM, *n. s.* 1. A propoſition evidnet at firſt ſight, that cannot be made plainer by demonſtration.—2. An eſtabliſhed principle to be granted without new proof.

Axiom, in rhetoric, is uſed by Hermogenes to denote grandeur, dignity, and ſublimity of ſtile.

Axioms, examples of. That the *whole* is greater than a *part*; that a thing cannot *be* and *not* be at the ſame time; and that from nothing, nothing can ariſe; are axioms indiſputable. Eſtabliſhed principles in arts and ſciences are alſo ſtiled axioms. Thus it is an axiom in phyſics, that nature does nothing in vain; that effects are proportional to their cauſes, &c. It is an axiom in geometry, that things equal to the ſame thing, are alſo equal to one another; that if to equal things you add equals, the ſums will be equal, &c. It is an axiom in optics, that the angle of incidence is equal to the angle of reflection, &c.

AXIOSIS, in rhetoric, denotes the third part of an exordium.

AXIS, *n. s.* the line real or imaginary that paſſes through any thing, on which it may revolve.

Axis, in anatomy, the ſecond vertebra of the neck, thus called becauſe the firſt vertebra, with the head, move thereon, as on an **axis**.

Axis, in aſtronomy, is an imaginary right line ſuppoſed to paſs through the centre of the earth and the heavenly bodies, about which they perform their diurnal revolutions.

Axis, in botany, a taper column placed in the centre of ſome flowers or catkins, about which parts are diſpoſed.

Axis, in conic ſections, a right line dividing the ſection into two equal parts, and cutting all its ordinates at right angles.

Axis, in geometry, the ſtraight line in a plain figure, about which it revolves, to produce or generate a ſolid. Thus, if a ſemicircle be moved round its diameter at reſt, it will generate a ſphere, the axis of which is that diameter.

Axis, in mechanics, the axis of a balance is that line which it moves, or rather turns about.

Axis, in optics, is that particular ray of light coming from any object which falls perpendicularly on the eye.

Axis, in peritrochio, one of the ſix mechanical powers, conſiſting of a peritrochium or wheel concentric with the baſe of a cylinder, and moveable together with it about its axis.

Axis, in zoology, a very remarkable animal, of the deer kind in all reſpects, except that neither the male nor female have horns; the tail is conſiderably long, and the whole ſhape and make are extremely like thoſe of the fallow deer. The female is ſmaller than the male, and both are of a reddiſh tawney colour, variegated with ſpots of white; the belly is white. The voice is much more loud and ſhrill than that of the deer. It is plain that this creature is neither of the red nor ſallow deer kind, whence Bellonius, who ſaw it at Cairo in Egypt, was induced to call it the **axis**.

Axis, common or **mean**, in optics, a right line drawn from the point of concourſe from the two optic nerves, through the middle of the right line, which joins their extremity.

Axis, determinate, in a hyperbola, a right line which divides it into two equal parts, and at right angles, an infinite number of lines drawn parallel to each other within the hyperbola.

Axis magnetical, or } in a line paſſing through the
Axis of a magnet, } middle of the magnet, lengthwiſe; in ſuch manner, as that however the magnet be divided, provided the diviſion be made according to a plane, wherein ſuch a line is found, the load-ſtone will be made into two load-ſtones. The extremities of ſuch lines are called the *poles* of the ſtone.

Axis of a planet is a line drawn through the centre, about which the planet revolves. The ſun, moon, and all the dlanets, except Mercury and Saturn, are known, by obſervation, to move about their ſeveral axis; and the like motion is eaſily inferred of thoſe two.

Axis of a sphere, or circle, is the ſame as **diameter**.

Axis of a veſſel, is an imaginary right line paſſing through the middle of it perpendicularly to its baſe, and equally diſtant from its ſides.

Axis of incidence, in dioptrics, a right line drawn through the point of incidence perpendicular to the refracting ſurface.

Axis of oscillation, is a right line parallel to the horizon, paſſing through the centre about which a pendulum vibrates.

Axis of refraction is that which is made by the ray of incidence directly prolonged on the inſide of the ſecond medium by the ray of refraction.

Axis of the cylinder, is properly that quieſcent right line, about which the parallelogram turns, by whoſe revolution the cylinder is formed. Though, both in right and oblique cylinders, the right line joining the centres of the oppoſite baſes is alſo called the axis of the cylinder.

Axis of the earth, is a right line upon which the earth performs its diurnal rotation from weſt to eaſt.

Axis of the ionic capital, is a line paſſing perpendicularly through the middle of the eye of the volute.

Axis of the zodiac, a line ſuppoſed to paſs through the earth and terminate in the poles.

Axis, spiral, is the axis of a twiſted column drawn ſpirally in order to trace the circumvolutions without.

AXLE, } *n. s.* the pin which paſſes through the
AXLE-TREE, } midſt of the wheel, on which the circumvolutions of the wheel are performed.

AXOLOTI, in ichthyology, a ſingular fiſh found in the lake of Mexico. It has four feet like the lizard, no ſcales, a matrix like a woman, and the menſtrual flux. It has the taſte of an eel. See Lacerta.

AXUM, or } formerly a large city, and capital of the
AXUMA, } whole kingdom of Abyſſinia in Africa, but now reduced to a miſerable village ſcarce containing 100 inhabitants. The ruins ſhow that it has once been very extenſive. It lies 125 miles W. of the Red Sea. Long. 111. 4. E. Lat. 14. 13. N.

AXUNGIA, in a general ſenſe, denotes old lard, or the drieſt and hardeſt of any fat in the bodies of animals: but more properly it ſignifies only hog's lard.

AXYRIS: A genus of the triandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The calyx of the male is tripartite: it has no corolla. The calyx of the female conſiſts of two leaves; it has two ſtyli and one ſeed. There are four ſpecies, none of them natives of Britain.

AY, *adv.* 1. Yes; an *adverb* of anſwering affirmatively.—2. It is a word by which the ſenſe is enforced; even; yes; certainly: and more than that.

AYAMONTE, a ſea port town of Andaluſia, in Spain, with a ſtrong caſtle built on a rock; ſeated on the mouth of the Guadiana; 85 miles N. W. of Cadiz. It has a commodious harbour, fruitful vineyards, and excellent wine. Long. 68. 15. E. Lat. 37. 12. N.

AYENIA, in botany: A genus of the pentandria order, belonging to the gynandria claſs of plants, and in the natural method ranking under the 37th order, *Columniferæ*. The calyx has two leaves; the petals are in the form of a [illegible] with long [illegible]; and the capſule has five cells. There are three ſpecies, all natives of the Weſt Indies.

AYLMOUTH, a town in Northumberland, on the mouth of the Alne, four miles E. of Alnewick. It has a good harbour for fiſhing veſſels. In the reign of Queen Elizabeth, the French held it and fortified it, as it was the firſt port near Scotland, where they could ſafely land their ſupplies for Mary of Guiſe, the queen regent. It is ſaid, that the bones of giants are often dug up in the neighbourhood.

AYTONIA, in botany: A genus of the monadelphia order, belonging to the pentandria claſs of plants; the characters of which are: The calyx is quinqueparte; the corolla conſiſts of four petals; the berry is dry, quadrangular, unilocular, and many ſeeded. There is but one ſpecies, viz.

Aytonia capensis, a native of the Cape, but of which we have found no particular deſcription.

AZALEA, American Upright Honey-suckle: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 18th order, *Bicornes*. The corolla is bell-ſhaped; the ſtamina are inſerted into the receptacle; and the capſule has five cells. There are ſix ſpecies, of which the moſt remarkable are the following.

1. Azalea nudiflora, or red American upright honeyſuckle, grows taller than the Viscosa, and in its native country will ſometimes arrive at the height of 12 feet, but in Britain never riſes to above half that height. It hath ſeveral ſtems with oblong ſmooth leaves. The flower-ſtalks ariſe from the diviſion of the branches, which are long and naked, ſupporting a cluſter of red flowers: theſe are divided at the top into five equal ſegments which ſpread open. This ſpecies, and the Viscosa, require a moiſt ſoil and a ſandy ſituation, and can only be propagated from ſlips, as they never produce good ſeeds in Britain. The autumn is the beſt time to remove the plants, and their roots ought to be covered in winter. They are moſt beautiful plants, and well worth cultivating.

2. Azalea rubriflora, a ſpecies with bright red flowers, was found by Mr. Lightfoot upon the tops of many mountains, in the Highlands of Scotland.

3. Azalea viscosa, with a white flower, is a low ſhrub, ariſing with ſeveral ſtems to the height of two or three feet. The leaves come out in cluſters without any order at the end of the ſhoots, and their edges are ſet with very ſhort teeth which are rough. The flowers come out in cluſters between the leaves, have much the appearance of honeyſuckle, and are well ſcented.

AZAMOR, a ſmall ſea-port town of the kingdom of Morocco, in Africa. It is ſituated on the river Morbeya, in the province of Duguella, at ſome conſiderable diſtance from its mouth. This town, though formerly very conſiderable, is not proper for maritime commerce, becauſe the entrance of the river is dangerous. It was unſucceſsfully beſieged by the Portugueſe in 1508; it was taken, however, in 1513, by the Duke of Braganza, but abandoned about the end of the 16th century. Long. 68. 0. E. Lat. 32. 50. N.

AZARUM, a ſmall, dry, blackiſh, medicinal root, much uſed in France as a ſpecific for the farcy in horſes. The azarum, called alſo *nardus sylveſtris*, grows in the Levant, Canada, and about Lyons in France. The firſt is reputed the beſt. It is given in powder, from the quantity of an ounce to two.

AZED, in the materia medica, a name given by the Arabian writers to a kind of camphor, which they make the third in value, placing it after the *alcanſuri* and *abriagi*. The firſt of theſe was the fineſt of all the kinds of camphor, and was collected tolerably pure from the tree, as it grew in Canſur, the place whence it was named. The firſt of theſe was the ſame camphor, rendered yet more pure by ſublimation: this was a diſcovery of one of the kings of that country, and that camphor was named from him. The third kind, or azed, was the ſame with what we now receive from the Indies, under the name of crude or rough camphor. The *azed* ſignifies only *large*, and was uſed to expreſs the camphor formed into large cakes. Avicenna ſays this camphor was groſs, of a duſky colour, and much leſs bright and pellucid than the other kinds.

AZEDARACH, in botany, the Bead-tree.

AZEM, Asem, Assam, or Acham, a country of Aſia, N. of Ava, little known to Europeans. It is ſaid to be very fertile, and to contain mines of gold, ſilver, iron, and lead, all which belong to the king, who, in conſequence of enjoying the produce, requires no taxes from his people. They have alſo great quantities of gum lac, and courſe ſilk. It is thought that the inhabitants of Azem were long ago the inventors of cannon and gun-powder; and that from them the invention paſſed to the inhabitants of Pegu, and from thence to the Chineſe.

AZIMEN, in aſtrology, certain degrees in the zodiac, which, when they are aſcendant, perſons born under them, are ſaid to be afflicted with lameneſs, or ſome other imperfection.

AZIMUTH, *n. ſ.* 1. The *azimuth* of the ſun, or of a ſtar, is an arch between the meridian of the place, and any given vertical line.—2. *Magnetical Azimuth*, is an arch of the horizon contained between the ſun's *azimuth* circle and the magnetical meridian; or it is the apparent diſtance of the ſun from the north or ſouth point of the compaſs.—3. *Azimuth Compaſs*, is an inſtrument uſed at ſea for finding the ſun's magnetic *azimuth*.—4. *Azimuth Dial*, is a dial whoſe ſtile or gnomon is at right angles to the plane of the horizon.—5. *Azimuths*, called alſo vertical circles, are great circles interſecting each other in the zenith and nadir, and cutting the horizon at right angles, in all the points thereof.

Azimuth, in aſtronomy, an arch of the horizon, intercepted between the meridian of the place and the azimuth, or verticle circle paſſing through the centre of the object, which is equal to the angle of the zenith, formed by the meridian and vertical circle. It is found by this proportion: As the radius to the tangent of the latitude of the place, ſo is the tangent of the ſun's or ſtar's altitude, for inſtance, to the conſine of the azimuth from the ſouth, at the time of the equinox.

Azimuth circles, are repreſented by the rhumbs on common ſea charts, and on the globe they are repreſented by the quadrant of altitude, when ſcrewed in the zenith. On theſe azimuths is reckoned the height of the ſtars and of the ſun when not in the meridian.

Azimuth compass, an inſtrument for finding either the magnetical azimuth or amplitude of an heavenly object. The learned Dr. Knight, invented ſome time ago a very accurate and uſeful ſea-compaſs, which is at preſent uſed in the navy, and will be found deſcribed under the article Compass. This inſtrument, with the following contrivance added by the ingenious Mr. Smeaton, anſwers the purpoſes of an azimuth and amplitude compaſs. The cover of the wooden box being taken off, the compaſs is in a condition to be made uſe of in the binnacle, when the weather is moderate: but if the ſea runs high, as the inner box is hung very free upon its centre (the better to anſwer its other purpoſes) it will be neceſſary to ſlacken the milled nut, placed upon one of the axis that ſupport the ring, and to lighten the nut on the outſide that correſponds to it. By this means, the inner box and ring will be lifted up from the edges, upon which they reſt, when free; and the friction will be increaſed, and that to any degree neceſſary, to prevent the too great vibrations, which otherwiſe would be occaſioned by the motion of the ſhip. To make the compaſs uſeful in taking the magnetic azimuth or amplitude of the ſun and ſtars, as alſo the bearings of headlands, ſhips, and other objects at a diſtance, the braſs edge, deſigned at firſt to ſupport the card, and throw the weight thereof as near the circumference as poſſible, is itſelf divided into degrees and halves; which may be eaſily eſtimated into ſmaller parts, if neceſſary. The diviſions are determined by means of a catgut line, ſtretched perpendicularly with the box, as near the braſs edge as may be, that the parallax, ariſing from a different poſition of the obſerver, may be as little as poſſible. Underneath the card are two ſmall weights, ſliding on two wires, placed at right angles to each other; which being moved nearer to, or farther from, the centre, counterbalance the dipping of the card in different latitudes, or reſtore the equilibrium of it, where it happens by any other means to be got too much out of lever. There is alſo added an index at the top of the inner box, which may be put on and taken off at pleaſure; and ſerves for all altitudes of the object. It conſiſts of a bar, equal in length to the diameter of the inner box, each end being furniſhed with a perpendicular ſtile, with a ſlit parallel to the ſides thereof: one of the ſlits is narrow, to which the eye is applied; and the other is wider, with a ſmall catgut ſtretched up the middle of it, and from thence continued horizontally from the top of one ſtile to the top of the other. There is alſo a line drawn along the upper ſurface of the bar. Theſe four, viz. the norrow ſlit, the horizontal cat-gut thread, the perpendicular one, and the line on the bar, are in the ſame plane, which diſpoſes itſelf perpendicular to the horizon, when the index box is at reſt, and hangs free. This index does not move round, but is always placed on, ſo as to anſwer the ſame ſide of the box. When the ſun's azimuth is deſired, and his rays are ſtrong enough to caſt a ſhadow, turn about the wooden box, till the ſhadow of the horizontal thread, or (if the ſun be too low) till that of the perpendicular thread, in one ſtile, or the light through the ſlit on the other, falls upon the line in the index bar, or vibrates to an equal diſtance on each ſide of it, gently touching the box, if it vibrates too far: obſerve, at the ſame time, the degree marked upon the braſs edge by the catgut line. In counting the degree for the azimuth, or any other angle that is reckoned from the meridian, make uſe of the outward circle of figures upon the braſs edge; and the ſituation of the index bar, with regard to the card and needle, will always direct upon what quarter of the compaſs the object is placed. But if the ſun does not ſhine out ſufficiently ſtrong, place the eye behind the narrow ſlit in one of the ſtiles, and turn the wooden box about, till ſome part of the horizontal or perpendicular thread appears to interſect the centre of the ſun, or vibrate to an equal diſtance on each ſide of it, uſing ſmoked glaſs next the eye, if the ſun's light is too ſtrong. In this method, another obſerver will be generally neceſſary, to note the degree cut by the nonius, at the ſame time that the firſt gives notice that the thread appears to ſplit the object. The other obſervations will be eaſily performed: only, in caſe of the ſun's amplitude, take care to number the degree by the help of the inner circle of figures on the card, which are the complements of the outer to 90″; and, conſequently, ſhow the diſtance from E. to W. The azimuth of the ſtars may alſo be obſerved by night; a proper light ſerving equally for one obſerver to ſee the thread, and the other the degree upon the card. It may not be amiſs to remark farther, that in caſe the inner box ſhould loſe its equilibrium, and, conſequently, the index be out of the plane of a vertical circle, an accurate obſervation may ſtill be made, provided the ſun's ſhadow is diſtinct; for, by obſerving the firſt with one end of the index towards the ſun, and then the other, a mean of the two obſervations will be the truth. Plate XXII. fig. 15, exhibits a perſpective view of the compaſs, when in order for obſervation; the point of view being the centre of the card, and the diſtance of the eye two feet. A B is the wooden box. C and D are two milled nuts; by means whereof the axis of the inner box and ring are taken from their edges, on which they move, and the friction increaſed, when neceſſary. E F is the ring that ſupports the innner box. G H is the inner box, and I is one of its axes, by which it is ſuſpended on the ring E F. The magnet or needle appears paſſing through the centre, together with a ſmall brace of ivory, that confines the cap to its place. The card is a ſingle varniſhed paper, reaching as far as the outercircle of figures, which is a circle of thin braſs; the edge whereof is turned down at right angles to the plane of the card, to make it more ſtiff. O is a catgut line, drawn down the inſide of the box, for determining the degree upon the braſs edge. P Q R S is the index bar, with its two ſtiles and catgut threads; which being taken off from the top of the box, is placed in two pieces, T and V, notched properly to receive it. W is a place cut out in the wood, ſerving as an handle.

AZIMUTH, MAGNETICAL, an arch of the horizon intercepted between the azimuth, or verticle circle, paſſing through the centre of any heavenly body, and the magnetical meridian. This is found by obſerving the object with an azimuth compaſs.

AZMER, a province of India, belonging to the Great Mogul. Its principle trade is in ſalt-petre.

AZOGA SHIPS, are thoſe Spaniſh ſhips commonly called the *Quickſilver Ships*, from their carrying quickſilver to the Spaniſh Weſt Indies, to extract the ſilver out of the mines of Mexico and Peru. Theſe ſhips are prohibited to carry any goods except for the king of Spain.

AZONI, in mythology, a term anciently applied to ſuch of the gods as were not the private divinities of any particular country, but were acknowledged in every country, and worſhipped in every nation. They were ſuperior to the gods called ZONÆI; who were ſuppoſed to inhabit particular parts of the world, and never to ſtir out of the diſtrict or zone that was aſſigned them. Such in Egypt were Serapis, Oſiris, and Bacchus; and in Greece, the Sun, Mars, the Moon, and Pluto. They were called by the Romans DII COMMUNES.

AZOOPHAGUS, in natural hiſtory, a term uſed by authors to expreſs ſuch inſects or animals as feed on herbs, never eating the fleſh of any living creature.

AZORES, or WESTERN ISLES, nine iſlands in the Atlantic Ocean, belonging to Portugal.—St. George, Gracioſa, Fayal, Pico, Flores and Corvo. They were firſt diſcovered, in 1439, by John Vanderberg, a merchant of Bruges, who was driven here by ſtreſs of weather. On his arrival at Liſbon, he boaſted of his diſcovery, on which the Portugueſe immediately ſet ſail aud took poſſeſſion of them, which they have retained ever ſince.—They have all a clear ſky and ſalubrious air; are extremely fertile, in corn, wine, and various fruits; and breed great numbers of cattle. It is ſaid they are quite free of venomous animals; but they are ſubject to earthquakes, and it is ſuppoſed they owe their origin to ſome ſuch dreadful convulſion. They are ſeen at a great diſtance, one of them having a very high mountain, called the Pico, or peak of the Azores. They are ſituated 900 miles W. of Portugal, and as many E. of Newfoundland, between 43° and 50° Long. E. and between 37° and 40° Lat. N.

AZOTH, in ancient chemiſtry, the firſt matter of metals, or the mercury of a metal; more particularly that which Alchemiſts call the *mercury of philoſophers*, which they pretended to draw from all ſorts of metallic bodies.

AZOTH, is alſo a name given to the philoſopher's ſtone. When the Arabs began to ſtudy chemiſtry, their metaphorical and hieroglyphical manner of writing ſeems to have given riſe to a practice, of calling the means made uſe of for bringing metals to perfection, by the name of medicines, and imperfect metals by the name of ſick men, and gold by that of a ſound and lively perſon. Hence it was ſuppoſed, that theſe were to be underſtood literally, eſpecially upon finding the impurities of the baſer metals called by the name of leproſies; and hence roſe the opinion, that the imperfect metals might be turned into gold, and the bodies of ſuch men into ſound ones, by the ſame preparation.

AZOTH, } or ASHOD, one of the five cities of the
AZOTUS, } Philiſtines, and a celebrated ſea-port on the Mediterranean, ſituated about 14 or 15 miles S. of Ekron, between that and Aſcalon. It was in this city, that the idol Dagon fell down before the ark, and ſo ſtrong a place it was, if we may believe Herodotus, that it ſuſtained a ſiege of 20 years, by Pſammiticus king of Egypt. It was, however, taken by the Maccabees in a much ſhorter time; who burnt both city and temple, and with them about 8000 men. The town is now called by the Arabs *Plaſaneyun*. It is but thinly inhabited, though the ſituation is very pleaſant: with regard to the houſes, thoſe that were built in the time of Chriſtianity, and which are now inhabited by Mahometans, ſtill preſerve ſome claim to admiration; but the

modern buildings, though generally of ſtone, have nothing in them which can attract the notice of a traveller. The ſtreets are pretty broad, the inhabitants moſtly Mahometans, with a few Chriſtians of the Greek communion, who have a church under the juriſdiction of the archbiſhop of Gaza. The town is about a mile and a half in circumference; and has in it a moſque, a public bath, a market place, and two inns. The number of the inhabitants is between 2 and 3000.—The moſt remarkable things in this place are an old ſtructure with fine marble pillars, which the inhabitants ſay was the houſe that Sampſon pulled down; and to the S. E. juſt out of the town, the water in which the Ethiopian eunuch was baptized by the apoſtle Philip. There are ſeveral ancient buildings, with capitals and pillars ſtanding.

AZURE, *adj.* blue; faint blue.

Azure, among painters, which at preſent ſignifies a fine blue colour reſembling that of the ſky, was formerly appropriated to *Lapis Lazuli*, and to the blue prepared from it. But ſince a blue has been extracted from cobalt, cuſtom has applied to it the name of azure, although it differs conſiderably from the former, and is incapable of being uſed for the ſame purpoſes, and particularly for painting in oil. The former at preſent is called *lapis lazuli*; or only *lapis*; and the blue prepared from it for painting in oil, is called *ultramarine*.—The name *azure* is generally applied to the blue glaſs made from the earth of cobalt and vitrifiable matters. This glaſs, which is called *smalt* when in maſſes, is called *azure* only when it is reduced to a fine powder. Several kinds of azure are diſtinguiſhed, according to its degrees of beauty, by the names of *fine azure*, *powdered azure*, and *azure of four fires*. In general, the more intenſe the colour, and the finer the powder, the more beautiful and dear it is. Azure is employed to colour ſtarch; hence it has alſo been called *starch-blue*. It is uſed for painting with colours, and for a blue enamel.

Azure, in heraldry, the blue colour in the arms of any perſon below the rank of a baron.

AZYGOS, in anatomy, a vein riſing within the thorax, on the right ſide, having no fellow on the left; whence it is called *vena sine pari*.

AZYMA, or Azymes, the feaſt of unleavened bread, among the Jews.

AZYMITES, in church hiſtory, Chriſtians who adminiſter the euchariſt with unleavened bread. This appellation is given to the Latin Church by the Greek, becauſe the members of the former uſe fermented bread in the celebration of the euchariſt. They alſo call the Armenians and Maronites by the ſame name, and for the ſame reaſon.

AZYMOUS, *adj.* ſomething unfermented, or made without leaven; as unleavened bread. Sea biſcuit is of this kind: and therefore, according to Galen, leſs wholeſome than bread that has been fermented.

AZYMUS, a term much uſed in the diſputes betwixt thoſe of the Greek and Roman Church; the latter of whom contend, that the bread in the maſs ought to be *azymus*, unleavened, in imitation of the paſchal bread of the Jews, and of our Saviour, who inſtituated the ſacrament on the day of the paſſover; and the former ſtrenuouſly maintaining the contrary, from tradition and the conſtant uſage of the church. In the council of Florence it was decreed, that the point lay at the diſcretion of the church; and that either leavened or unleavened bread might be uſed. The weſtern church has preferred the latter.

AZZALUM, in the ancient phyſiology, a ſpecies of iron, reputed the moſt excellent of all, ſuppoſed to have been brought from India, whence it was called *Indicum*, but, in reality, according to ſome, brought from China.

END OF THE FIRST VOLUME.